









*Splendidum Opuntia Monocantha.* | *Aechina Sepiflora Mammillaria*



# GREENHOUSE.

Hot House and Stove

by

CHARLES MCINTOSH. F.L.S.



London.

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PATERNOSTER ROW

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THE

# GREENHOUSE,

HOT HOUSE, AND STOVE:

INCLUDING

SELECTED LISTS OF THE MOST BEAUTIFUL SPECIES OF  
EXOTIC FLOWERING PLANTS, AND DIRECTIONS  
FOR THEIR CULTIVATION.

BY  
CHARLES MINTOSH, F.H.S.

GARDENER TO HIS MAJESTY THE KING OF THE BELGIANS, AND AUTHOR OF "THE PRACTICAL  
GARDENER," &c.

LONDON:

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## P R E F A C E.

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THE cultivation of exotic plants has usually been treated of in works devoted to Horticultural Science generally, so that we have no modern treatise especially devoted to the management of the Greenhouse. Hence the reader whose attention is directed to this branch of the science only, is subjected to the task of wading through a mass of matter at once devoid of interest and utility to him. The present publication, which is strictly confined to flowering plants requiring the protection of the Greenhouse and its kindred structures, is a humble attempt to supply this want.

The arrangement of the subjects is novel, and, it is believed, will be found to have many practical advantages; the work being divided into sections, which comprise plants requiring for the most part the same temperature and mode of management. The instructions for culture are not those of a mere theorist, but derived from the daily experience of many years; and the author has endeavoured always to use language so plain and free from technicalities as to be clearly understood by every class of readers.

The preliminary remarks on Hothouse Architecture and Modes of Heating are the result of pretty extensive experience in these departments. Those on the latter are free from bias towards any particular mode. Experience is in this, as in all other matters, our only safe guide; a remark which is exemplified by the fate of many ingenious theories on this subject, which are rapidly falling into oblivion.

The Select Lists of Plants are compiled from notes made in the author's own practice, and comprise most of those which are remarkable from their splendour or fragrance, or some other peculiar merit. Should any such, however, have escaped the author's notice, the intelligent cultivator will have no difficulty in referring them to their respective situations in the Lists.

In the course of a work of this extent, some typographical errors were to be expected; but the author is not aware of any whose meaning is not made sufficiently clear by its context without the insertion of any list of errata.

Claremont, September, 1838.

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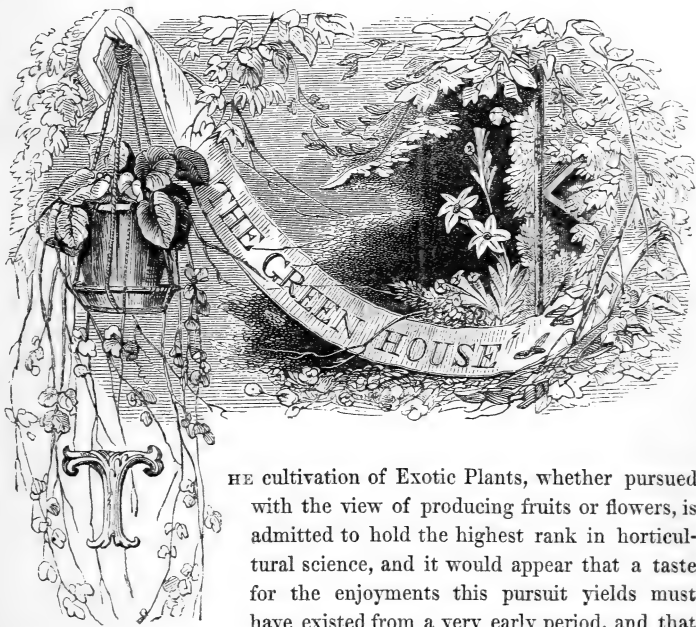
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THE cultivation of Exotic Plants, whether pursued with the view of producing fruits or flowers, is admitted to hold the highest rank in horticultural science, and it would appear that a taste for the enjoyments this pursuit yields must have existed from a very early period, and that

it has kept pace with the more refined and peaceful arts wherever these have flourished. The writings of Virgil, Horace, Seneca, and Martial sufficiently prove, that among the nations of antiquity a very strong attachment existed for cultivating exotic flowers and the two latter historians speak practice both of retarding and producing them prematurely by artificial means during the more luxurious days of the empire.

About the commencement of the fifteenth century, the wealthy merchants of Venice and Genoa began to introduce the plants of the East into Europe, and botanical collections were commenced by the inhabitants of these opulent and enterprising cities. The wealthy Flemings also, according to Lobel, imported plants from the Levant and the East

Indies as early as the times of the Crusaders and under the Dukes of Burgundy, and their gardens are said to have contained more exotic plants than all the rest of Europe besides, until the civil and desolating wars of the sixteenth century diverted men's minds from such peaceful pursuits.

About the middle of the sixteenth century, a taste for exotic flowering plants began to prevail in Britain, for about this period the gardens of the Duke of Somerset at Sion House, Edward St. Loo, in Somersetshire, James Coel at Highgate, James Nasmyth, and of the celebrated Gerrard were established; and Nicholas Lete, Sir Walter Raleigh, Lord Edward Zouch, and Lord Hudson are all recorded as importers of new and rare plants.

Greenhouses and stoves were first erected in this country during the seventeenth century, and the Duke of Lauderdale, Sir Henry Cappel, and Lady Clarendon are recorded by Evelyn as patrons of exotic gardening during this period.

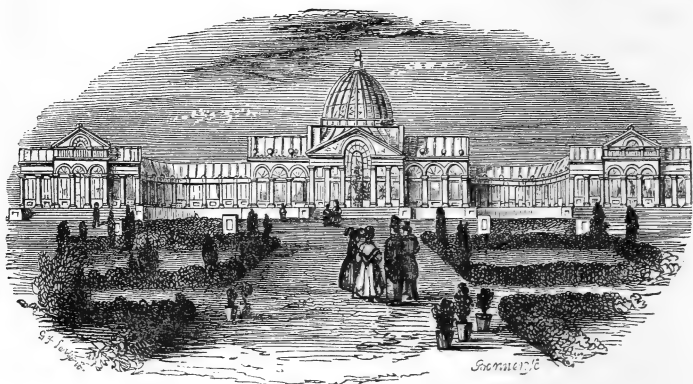
During the early part of the eighteenth century, the cultivation of exotic plants was carried on with great spirit, upwards of five thousand species being introduced from foreign countries during the period, besides the discovery of many indigenous species. The great patrons of the art at this time, were Sir Hans Sloane, to whom we are also indebted for the foundation of the British Museum, the Duke of Chandos, Compton, Speaker of the House of Commons, Compton, Bishop of London, the Duke of Argyle, the Drs. Uvedale, Lloyd, Sherard, Fothergill and Pitcairn, the gardeners in most repute being Miller, Fairchild, Lee, Gordon, Knowlton, and Gray. The latter part of the eighteenth, and the beginning of the nineteenth century, however, has been the great botanical era for which this country will ever be conspicuous. The discovery of Australia, the extension of the British power in India and both the Americas—aided by the patronage of the most wealthy aristocracy in the world, including the sovereign himself, who thought it not beneath his dignity to join his subjects in sending out collectors to all quarters of the globe. Their united exertions have brought a combination of power to bear on botanical discovery, which has been attended with the most happy result, to which the enterprising commercial spirit of the late Messrs. Lee and Kennedy, the most celebrated collectors of those days, rendered essential assistance.

Not only have botanical and horticultural gardens been established in all our principal cities, but private ones are maintained with princely liberality by many of our nobility and gentry, amongst whom the Dukes

of Devonshire, Northumberland, and Bedford, deserve honourable mention. Indeed, the taste for exotic botany and floriculture seems to prevail among all classes; and the number of collectors employed in different parts of the world is a proof that the taste is rapidly increasing.



*Clematis Sieboldii.*



### GREENHOUSES.

BEFORE entering into any details respecting the cultivation of greenhouse flowering plants, it may be necessary to offer some preliminary remarks on the arrangement and erection of such structures as are necessary for their successful cultivation, founding our observations on the principle of economy of fuel, elegance of design, and fitness for the end in view. We cannot, perhaps, do better than precede these remarks by the accompanying view of the Duke of Northumberland's splendid conservatory at Sion House.

In taking a retrospective view of what has been already written on this subject, it would appear, that authors for the most part have confined themselves to providing for the wants of the great and the opulent, while the more humble, and by far the most numerous class of plant cultivators have been left as it were, without the benefit of instruction. To supply this deficiency will be one of the objects kept in view in the following remarks; we shall also endeavour to treat this subject so as to embrace the greatest possible variety of circumstances, and as a rule from which there should be few deviations, we recommend the adaptation of the structure—first, to the circumstances of the proprietor; next, to the capabilities of the situation; and lastly, to the description of plants intended to be cultivated in them.

In regard to situation, something depends on the taste of the owner, the style of his mansion, the extent and position of his garden, the species of enjoyment he is most desirous of obtaining, but much more on that situation being as much as possible exposed to the full influence of light and air, and as free from the shade of trees or buildings as possible. It is not necessary, however, for ordinary purposes, that the greenhouse should exactly front the meridian sun, for whether it be placed immediately in connection with the mansion, or stand as an object of decoration in the flower garden or shrubbery, its front (all other circumstances being favourable) may be either to the south, south-east, south-west, or any of the points of the compass which intervene.

No species of horticultural structure admits of such a variety of modifications as that now under consideration, and hence it is that we see plant houses in every diversity of relation, from the most refined perfection of taste, to the extreme point of absurdity. The success of the cultivator will, however, be found nearly in proportion to the position his house occupies between those extreme points, and the cause of failure evidently arises from a want of previous arrangement in adapting the structure to local circumstances, and the object to be attained.

It frequently happens, that greenhouses are built without any previous consideration as to what plants are to be cultivated in them; this is setting out upon the worst principle possible, because, what might be an excellent situation for an Orangery or Camellia house, would be the very worst possible for a Heathery or Geranium house; the two former can accommodate themselves to a very limited degree of light and air, while the latter cannot have either supplied in too great abundance. Again, a house intended for large specimens of plants, would be the worst possible structure for young or small plants; as for the former purpose a lofty house would be required, while for the latter it can scarcely be too low, small plants requiring to be placed as near to the light as possible.

We may here observe, that one of the most common faults fallen into by greenhouse builders, is that of making them too lofty to suit the majority of plants to be cultivated in them. This fault is not only unfavourable to the plants cultivated, but occasions an unnecessary expense in the first erection, and entails a considerable annual cost ever afterwards; low, and rather narrow houses are better for general purposes, (particularly if on a small scale), than lofty and wide houses, as the plants are then placed, not only in a better position as regards light and air, but are seen to greater advantage by the observer. It is also better to have several small houses, each set apart for particular families of

plants, than to have larger houses with a view to growing them indiscriminately.

Such lofty and extensive ranges of plant structures as those at Sion, Alton Towers, and other places, may be all very well in their respective places, and may not be beyond the proper scale of grandeur necessary to correspond with the princely objects surrounding them; but so far as plant culture alone is concerned, no arrangement can be more unsuccessful, as may be seen in contrasting the state of plants in such houses with those grown in structures of humbler dimensions. If it were possible, indeed, to cover a sufficient space of ground with a glass roof, under which the trees of Australia, for instance, could be seen in the full developement of their growth, there might be some advantage, but to attempt to exhibit any thing like the natural character of such trees in their full proportions, under such buildings as has hitherto been aimed at, is a very vain attempt. From the nature of the atmosphere in such houses, trees and plants will extend themselves till they reach the top, but during the struggle the more delicate, and often the more valuable ones, are overcome by their more robust neighbours, while even these present mere skeletons, furnished with a few branches and leaves at the top, while the naked stems, scarcely able to support themselves, are without a bud, branch, or leaf. Not so the same genera of plants cultivated in moderately sized houses: under such management they branch out from the surface of the pot upwards, covered, in their seasons, with a profusion of blossoms, delighting the eye with the brilliancy of their colours, and the sense of smelling with the fragrance of their perfume.

As to cultivating a general collection of plants in the same house, although very generally attempted, it is by no means to be recommended. The treatment by different families of plants, varies so much at certain seasons, that the best cultivators have found, from that sure test, experience, that it is better to appropriate separate houses to such families as nearly agree in culture and habit.

Such is our view of the subject: plants to be well cultivated ought to be divided into groups, in a somewhat similar manner to that sketched out in the following pages. The cultivator who shall direct his attention to one, two, or more of these divisions, according to his taste and circumstances, will be much more amply repaid, than if he were to congregate plants of discordant habits, and of different climates, into one habitation, merely for what he may choose to call variety, or a rich collection of species. The mania for accumulating species, instead of forming judicious selections of good flowering plants, has produced very baneful effects in the English



gardens, not only by excluding old and good plants, merely because they had long been denizens amongst us, but by introducing many which have no other merit to recommend them than novelty; how many of the plants of New Holland are cultivated, scarcely worth the pot in which they grow, otherwise than in a botanical point of view, as may be instanced in the genera *Eucalyptus*, most of the *Hakea*, *Petrophila*, and *Isopogon*. We repeat, that if greater attention was paid to the selecting of fine flowering plants, and cultivating individual specimens well, instead of crowding our greenhouses with inferior plants, to the destruction of each other, they would present a very different appearance to what they usually do. Next to forming selections, instead of attempting collections, we would recommend to cultivators, and to amateur cultivators in particular, to confine their culture and attention to some one of the divisions we have enumerated. In this respect, our continental neighbours far excel us, and by confining themselves to the cultivation of certain families, they have become conspicuous in these departments.

How far the florist has excelled the general collector in this particular, we need hardly state; by confining himself to his tulip bed, his auricula stage, or his carnation stand, he is enabled to cultivate them in great perfection,—not so the general collector;—the florist has the economy of those three families to study, while the general cultivator has probably that of three thousand, and those congregated from the most opposite quarters of the globe, and existing under the greatest diversity of circumstances. We might justify these opinions by referring to the success with which Messrs. Rollisons, of Tooting, cultivate the *Ericas*, and latterly the *Orchideæ*, and of Messrs. Chandlers, of Vauxhall, in the cultivation of *Camellia*, were such proof necessary; but it speaks for itself, and the same reason applies to every pursuit of mankind; where undivided attention is given to any of our pursuits, an approximation to perfection in that pursuit may be expected. The divisions or groups into which we should like to see all greenhouse exotics arranged, would be something like the following:

THE HEATHERY,  
THE GERANIUM HOUSE,  
THE CAMILLIA HOUSE,  
THE BULB HOUSE,  
THE SUCCULENT HOUSE,  
THE MIXED GREENHOUSE,

THE ORANGERY,  
THE CONSERVATORY,  
THE PLANT VERANDA,  
PROTECTING TENT,  
COLD PIT,  
THE STOVE.

To this arrangement it may be supposed that we should have added **THE AQUARIUM**, but as most exotic aquatics are intra-tropical, we shall notice them when we come to treat on the subject of plant stoves.

In the progress of this work it will be seen that arrangements have been made, which we trust will meet the views of most of our readers, by offering selections of such plants as may be admitted into each of these divisions, without infringing the rules we have laid down. And as this is the first time that such an arrangement has been recommended upon so general a principle, we shall rejoice to see it reduced to practice by some of our enterprising and intelligent readers.



## HOT HOUSE ARCHITECTURE.

ALL horticultural erections should be of wood, in preference to metallic matter, not only because of its greater economy and fitness for the purpose, but also on account of durability and elegance of effect. We are perfectly aware that this has been a controverted point, but we have been so situated as to be enabled to judge of the relative merits of both without prejudice or interest, and our conclusion, after the experience of thirty years, is in unison with those of the majority of intelligent gardeners, who alone are capable of judging, as their conclusions are drawn from actual practical experience. It would be out of place here to enter into the merits or defects of either; but we think it necessary so far to explain our opinions on this subject, that our views may be the less liable to misconception in the remarks on the plant structures we think necessary for the production of fine flowering exotics.

We are also supported in these views by Mr. Thomson, of the Sion nursery, Norwood, whose experience in those matters justify us in quoting his authority. "Having had fifteen years of practical experience in managing upwards of three thousand running feet of glass," he says, in a communication prepared by him for this work, "I am enabled to speak with some decision on the subject, and I feel fully justified, indeed, in saying, that when the respective merits of wood and iron are fully ascertained, the prejudice in favour of the latter will cease to exist in the minds of those practically acquainted with the properties of the two materials. The expansive power of metallic substances is very great, and so powerful have I known the action of the sun's rays in expanding the iron rafters of a large roof on a hot summer's day, that the strength of two, and sometimes three men has been insufficient to force down the sliding lights for the admission of air. In fully equal proportions have I witnessed the contraction of the metal during the intensity of winter, leaving large apertures between the rafters and the lights, and admitting the external air sufficiently to counteract the power of two strong flues. This occurrence took place in February, 1830, and the house in question was of moderate dimensions, when compared to the wood-roofed vinery I am about to contrast it with. The building was forty feet long, by sixteen wide, and nine feet high, having a pit in the middle for the culture of pines, which very much reduced the quantity of air to be rarified. The wood-roofed vinery was fifty feet long, by fourteen feet wide, and fourteen

feet high, without any pit in the middle; the result of my observations on those two houses, and the quantity of fuel required by each of them, was as follows: The iron-roofed house with eighteen degrees of frost, required nearly six bushels of coals, and unremitting attention during the night and until three o'clock in the morning, while scarcely three bushels were consumed in keeping the vinery at the same degree of temperature, no attention being required after ten o'clock, at which time the fires were made up and left for the night.

"Being determined to investigate thoroughly the merits of the two materials, I caused one house, constructed of wood, and another of iron, of precisely the same dimensions as regards the superficial feet of glass, to be perfectly repaired, in the autumn of 1832, and on having them examined and repaired in the following season, I found that the cost of repairing the iron house was nearly double the sum required to repair the wood one, which I attributed to the expansion of the iron in summer and its contraction in the winter. From these and other experiments I have had opportunities of making, I have arrived at the conclusion, that wood has the advantage over iron in four very essential points, viz., the saving of fuel, glass, and labour. I have also found it conducive to the better growth of plants and fruits, as I have never found the plants thrive so well or look so healthy in an iron, as in a wooden-roofed house,

"I am aware that for lightness of appearance in the structure, iron has hitherto had the advantage, but I am confident that if proper attention were paid to the erection of hot houses, and to the materials used in their erection, the appearance of the wood roof would be less objectionable, and for the assistance of persons of less practical experience than myself, I here give a brief description of the materials and mode of construction I would recommend, as combining all the desired objects. The first thing to be attended to is, to give the roof a proper pitch or inclination, so as effectually to carry off the water, and to prevent drip into the house, which is highly injurious to all plants, particularly to those grown in pots; the rafters should be of wood, varying according to the length of the roof, from six to eleven inches in breadth, and the section of the rafter should be wedge-shaped, from three to four inches wide on the upper side, where the lights rest, and about half an inch wide on the under side. The strength of all rafters depend more on their depth than thickness. The shade would be also less. The four sides of the lights (all made of wood) should be as follows,—the top should be from five to six inches wide, the sides two and a half inches, and the bottom from six to



seven inches, and to prevent as much as possible the obstruction of light, the sash bars should be made of copper, which need not be more than half an inch square; this will give the house at once a light and neat appearance, without subjecting the plants to the injurious extremes of hot and cold temperature, which would be the result of a roof entirely metallic, and without increasing the cost of erection.

“These few hints are thrown out for the guidance of parties desirous of erecting the most perfect kind of forcing houses; but it will be obvious that before undertaking any structure of this kind, the various questions of locality, as well as the use for which it is wanted, must be taken into consideration, and on these subjects we recommend that the practical gardener should be consulted, whose experience will be found of much more utility in laying down the various conveniences essential to a well ordered house, than the architect or surveyor. I witnessed a remarkable illustration of this during the past summer, in the total destruction of a fine crop of grapes, as well as of the foliage, in the hot house belonging to a gentleman in Kent. The house was erected of cast iron, about six years ago, and the catastrophe occurred through the carelessness of the architect in not providing proper ventilation, the gardener, who is admitted to be an excellent practical one, was compelled to have holes, about a foot broad and three feet long, made in the back wall of the second house, for ventilation, these he covered by shutters hung on hinges, to prevent the fruit from sharing the same fate; he preserved the fruit by this means, but not without great injury to the foliage.”

We have availed ourselves of Mr. Thompson's opinions because he had ample opportunities of drawing unprejudiced conclusions during the period he had the direction of the extensive hot houses at Sion, which have been considered the perfection of metallic houses. To his testimony we might add that of many others of equal credit, but we shall conclude by referring the reader to the opinions of Mr. Paxton of Chalworth, Mr. M'Murtrie of Shughborough, and Mr. Thompson, late of Welbeck, published in the *Trans. of the Hort. Soc. and Hort. Reg.* for ourselves.

We only know of one architect who has attained any celebrity in hot house architecture, and that is W. Atkinson, Esq., of whose improvements we shall have occasion elsewhere to allude.

## HEATING GREENHOUSES.

AMONGST the various methods of heating greenhouses, hot water is certainly the most economical, efficient, and certain; but under ordinary circumstances, so little artificial heat is required for greenhouses, strictly so called, that we think the erection superfluous, unless where it can be put up at the same expense as the common flue. There are circumstances, however, where its application can be made to them with advantage, namely, when several houses are to be heated at the same time, and attached together so that one boiler may serve the purpose of several, or where the greenhouse is so placed that the back, or one of the ends, may be connected with the walls of the kitchen, or with some part of the dwelling house, where a constant fire is kept up. In this case, a boiler may be so constructed as to be heated by the fire used for domestic purposes, by means of a pipe communicating through the wall, with the pipes in the greenhouse. A small greenhouse might be heated by this means from any ordinary kitchen, or even parlour fire; a cock, upon Kewley's principle, being placed so as to turn the hot water off or on, at pleasure.

For tropical plants, where a considerable temperature is required, a hot water apparatus should be fitted up expressly for the purpose, unless the stove be of very limited dimensions, and placed so as to be heated as above; but we shall have occasion to return to this subject when we come to treat of plant stoves.

The degree of heat required for greenhouses is just sufficient to repel frost and to dispel damp. To effect the former, if the winter be mild, the fire may not be requisite more than from three to twelve nights in the course of the winter, and the degree of heat need not be more than sufficient to warm the flue. When required for drying up superfluous damp, if the house be properly glazed and care taken not to spill water unnecessarily, one or two fires during the season may be sufficient. These, let it be observed, should be applied during the day, when the house can be fully ventilated, for the escape of the damp air. It is to be observed, that when required for dispelling frost, the best, and, perhaps, the most simple rule is, not to apply the fire until the frost appear to be forming on the inner surface of the roof lights, excepting in the geranium house, where it should be applied when the frost is forming on the outer surface of the glass. The application of heat will be more fully explained under each division, as no general rule can be safely acted upon.



The economy of fuel is a matter of so much importance, that whatever plan can be devised for lessening its consumption, must be received as a national benefit. Much has been written, and, we fear, to little purpose, on the economy of fuel when applied to domestic purposes. Much less has been written, and much more effected by practical experience in the economy of this article, when applied to horticultural purposes; and in all probability, the perfection of the principle of heating has been attained by the invention and application of the hot water system.

In endeavouring to lay down rules for regulating the temperature of greenhouses, plant stoves, &c., it will sufficiently appear that the same rules are equally applicable to forcing houses, pits, and structures of every denomination. To render our views on this subject as clear as possible, we shall give a brief detail of the various modes practised, pointing out, as we proceed, the merits or defects of each. We adopt this arrangement because hot houses are erected under such a variety of circumstances, that some one of the various modes detailed, may, in some cases, be found more convenient and practicable than others.

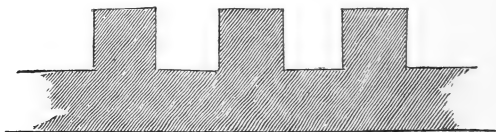
The Dutch, to whom we are indebted for our first hints on the application of fire heat as a medium for warming hot houses, employed earthenware or can flues at first, and, in many cases, these are employed to the present day. These consisted of pipes, similar to those used for conveying water, but of larger dimensions, being seldom less than from nine to twelve inches in diameter, they were joined together with cement, and sometimes placed upon bricks, to keep them clear of the borders, at other times they were embedded in sand, with the view of retaining the heat longer in the house. The advantages of these flues are, that they can be rapidly heated, and, therefore, may be used with advantage in greenhouses and pits where moderate fires are used, and where the intention is to repel sudden attacks of frost; but they require unusual attention, as they are quickly heated, and cool with equal rapidity. These flues were formerly much used in this country, but have long since given place to brick ones, as being more safe and steady in their operation.

The next improvement in heating, originated also with the Dutch, and consisted of broad and deep flues; the former is still used very generally in Holland and Germany, and the latter is almost in universal use in Russia. These, also, were adopted in this country, but have in their turn long ago given place to other forms.

The most primitive mode in use in this country, however, was to build

them in the ground like drains ; this mode was afterwards changed to that of building them in the solid walls, either at the back or front of the house. By this means much of the heat was lost in the solid building, little of it finding its way into the house. But the most rational improvement which followed this, was the practice of building them quite detached from all other description of walls.

J. R. Gowen, Esq., in the "Horticultural Transactions," vol. III., proposed flues constructed of bricks, of the usual thickness at the sides, and hollowed out in the middle, with the view, no doubt, of attaining equal strength to the flue in general use, and admitting, at the same time, of the more ready escape of the heat into the house through the thinner parts. The covers of these flues were hollowed out in a similar manner to the bricks with which the sides were built.



Sir George M'Kenzie, in the work last quoted, recommended what he called an embrasure flue, of which the annexed diagram will give some idea. The principle of this flue is that of exposing a greater heated surface in proportion to its length. This flue was found to fall far short of the expectations of its inventor, in practice, and was only in a very few cases adopted. The same intelligent gentleman proposed for trial a riangular cast iron flue ; but, like the flues proposed by other individuals, of the same material, was found to possess no advantage whatever, but were liable to many objections, of which that of being rapidly heated and as soon losing their heat, were not the least.

The German stove, with iron pipes for conveying smoke and heat, has been long used on the continent, but is liable to the objections stated as belonging to the last. The improved flue recommended by Mr. Loudon, in "*A Treatise on Several Improvements in Hot houses*," &c., p. 33, consisted in dividing the flue into chambers, or compartments, with a view to arrest the progress of the heat, and to fill each chamber with smoke and heated air before the one next in front of it could become occupied with it, and so on till these chambers at last became all completely charged with heat, before any could escape at the chimney top. This, as well as the hot air flue built on the top of the ordinary flue, recommended by the

same authority, were found to be inferior to the most ordinary description of flues then in use. Indeed, the latter improvement, viz., the hot air flue, the late Nicol proved "to be worse than useless."

Formerly, flues were built partly under ground; only the better constructed ones of that period were above it, but not separated from it, a circumstance which kept them continually damp, impeded the draught, and lost a very considerable portion of the heat. Succeeding improvements suggested the propriety of not only building all flues upon arches, or a solid foundation of brick work, but also of elevating the flue one brick or more above the level of the borders. This was the last and most important improvement in the erection of flues. We may, however, here observe, that cast iron plates were recommended as covers for flues; and also pavement stones, as well as tiles, both plain and hollowed out, to hold water for the purpose of steaming the house. The former of these are very objectionable; the second very good, when stone of a quality capable of standing the heat to which flues are exposed can be procured; and the third and fourth, for general purposes, the best of all.

Flues constructed entirely of flag stones have been tried, but it is difficult to procure stone calculated for this purpose, besides, no stone with which we are acquainted, is so well adapted for the transmission of heat, as well prepared and not over burnt tiles and bricks.

No flue should be plastered, either within or without, as plaster is a bad conductor of heat, and, therefore, very unfit for the purpose.

Various other sorts of flues have been since recommended by different writers in the Horticultural Soc. Trans. and elsewhere; but as they are mostly modifications of those already noticed, it would be superfluous to attempt their descriptions.

The best of all flues are those most commonly in use in well ordered houses: they are built of thin well burnt and regular sized bricks, placed on edge, and neatly jointed with well prepared mortar, but neither plastered inside nor out. Such flues vary in their dimensions from nine to twelve inches in width inside, and from fourteen to eighteen inches in height. They are always covered with tiles, either plain, or hollowed out for holding water, or with flag stones of a description calculated to stand the heat. In most cases, the flue should enter through the back wall at one end of the house, pass on to within two or three inches, or more (according as space will admit) of the front wall or parapet, run parallel with it to the extremity of the house, pass round the farther end, and return parallel to the back wall, and within two or three inches of it. Or, after having reached the extremity of the house, the flue

may return within a few inches of the former, and in both cases the smoke will escape through the back wall near to the furnace. Two narrow flues are better than one broad one of a capacity equal to both. In narrow flues, the velocity of heat is much greater than in broad ones, therefore, it sooner reaches the end farthest from the fire, and consequently maintains a more regular degree of temperature between both ends of the house. Flues should never, if it can be avoided, be built upon the top of each other; neither should they be placed at too great a distance from the front of the house, which is in all houses the coldest part. If a flue be placed in the centre of a house, it would appear at first sight, from the well known property of heat, that it would radiate equally from each point, and that the centre of the house would be the most proper situation for the flue to be placed in. That the heat would radiate in this manner, is quite true; but the lower and front part of the house being colder than any other parts, the pressure of the cold air would be so great, that the particles sent off by radiation from the flue, would be unable to resist it with sufficient force. It will, consequently, remain the coldest part of the house, and, therefore, the most proper situation for the flues to be placed in.

The use of dampers have been recommended, and these have been of various constructions: the object to be attained by them is to regulate the heat in the flue, and also to prevent its escape from the chimney top, by confining it in the flue and causing it to escape into the house through the bricks. This would no doubt be all very well, if we were certain of the purity of the heat so enclosed, or if there were a total absence of expansibility in the nature of heat; but if heat be so enclosed, it is apt to expand to that degree, that the flues would not be able to contain it, and an explosion might be the consequence, which might prove destruction to the whole contents of the house. The best mode of regulating flues is decidedly the proper use of a good furnace, with double doors and an ash pit register. With such an apparatus and a well constructed flue, every object of the cultivator may be accomplished.

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## STEAM APPARATUS.

IN an age when steam has almost revolutionized the commercial interests of the world, we need not be surprised at its application to the purposes of horticulture. The first attempt to accomplish this appears to have been made by Wakefield, in 1788, but of the success of his plan we have no certain record. Its first successful application was made in 1792, by Butler, then gardener to the Earl of Derby; but it was not till about 1816 that the process of heating by steam became at all general. About that time the forcing-houses in Kensington Gardens, those of the Messrs. Loddiges, of Hackney, and others equally extensive, were heated by this means; and where an extensive range of houses is to be heated, or where it can be applied to other purposes, as is done by Mr. Gray, of Hornsey, we have no hesitation in advocating this method of heating. This gentleman, by the aid of two boilers, a large and small one, (the latter to be used when the least heat was required) warmed in his garden ten large hot houses, the largest of them five hundred and fifty feet distant from the boiler, and containing in all above fifty thousand cubic feet of air. Besides this, the mansion, farm-yard, and out-offices were also heated at the same time.

Among other proofs of the advantages of steam, we may state that the uniformity of the heat is such, that the tubes close to the boiler cannot be heated beyond two hundred and twelve degrees, while, at the distance of one or two thousand feet, or, indeed, any definite number of feet, nearly the same degree of heat may be found. We have already noticed that this is the principal advantage of heating by steam. The secondary advantages are the economy of fuel and of labour, and the possibility of keeping the whole hot house department in neat and compact order. Instead of a number of furnaces, stock holes, and other ordinary modes, by this method the whole may be confined to one chamber, which may be placed at a sufficient distance to be completely hidden from any part of the garden, and, instead of a number of chimney tops, each giving out its column of smoke, only one will be necessary, that being so contrived as to be hidden from the principal walks and points of view. In addition to these, may be added the small space occupied by the steam pipes compared with smoke flues; and their capability of passing under foot paths, over door ways, and similar obstructions, which smoke flues cannot be expected to do.

A prejudice in favour of steam seems to have arisen as soon as its

application became general, from the notion that houses heated by this means would be exempt from insects. No such thing is the case, for heat is the same material, and has the same effect, whether given out from a steam pipe, hot water pipe, or a well jointed and smoke-tight flue.

The expense of erecting a steam apparatus for the purpose of heating hot houses of ordinary dimensions, would be extravagant. But other objections might be stated against its application by means of tubes, had not the mania for heating by steam given way to the more rational one of heating by hot water.

Steam has been applied in a variety of ways in heating plant houses, but that of causing it to heat a mass of building materials, rough roubell stones or pebbles, appears to us to have been the most rational and economical. This plan was tried by that eminent garden architect, John Hay of Edinburgh, so early as 1807, and has been subsequently improved upon in many of the gardens built by him since that period. When this mode of heating is intended to be applied, the interior of the house, which is usually occupied with the bark bed, or pit, in which the plants are plunged, is filled to the thickness of from three to four feet, that is, to about the depth of the tan bed formerly used, with stones, broken to the size of from three to six inches in diameter. Through this mass the steam pipe passes, perforated with small holes along its two sides, for the escape of the steam, which thus enters and heats the mass of stones. When once heated, these will retain warmth, sufficient for tropical plants, for twenty four hours in the coldest weather, and for two or three days in mild weather. From this it would appear, that the steam has only to be let on at these periods; at all other times it may be dispensed with or applied to other purposes. When the steam is let on to heat this mass of matter, it should be continued until it ceases to condense amongst the stones—a proof that they are heated to its own temperature.

The superfluous steam of manufactories or engines might be economically applied to heat plant houses upon this principle. And we are also of opinion that it might be applied in such situations to heat pits for pines, grapes, peaches, and strawberries, which would render these fruits as plentiful, and nearly as cheap at Christmas as at Midsummer. A very lengthened account, accompanied with several engravings, showing the operation of heating upon Hay's principle, has been published in the Memoirs of the Caledonian Horticultural Society, to which those particularly interested are referred. Steam, for this purpose, has been turned into vaults under the plant house, but not with the satisfactory

result anticipated ; and others have filled the space with faggots, through which the steam circulated, but with no better effect. Broken bricks we conclude to be the best material to use for this purpose, as they are better retainers of heat than hard stones, but these may be objected to on account of their being less durable.

Steam has also been applied to heat a large cistern of water, placed in the centre of the house, and under where the plants stand. To explain the operation of this process, let us suppose, that instead of a bark bed, a tank of the same length and breadth is substituted, and filled with water about a foot or eighteen inches deep. Through this volume of water a two inch steam pipe is made to enter at one end, and after proceeding to the extremity, is made to return again to the end at which it entered. The steam is let into these pipes about twice a day, and the temperature of the water is ascertained by leaving a small opening at each end, into which a thermometer can be introduced. These openings also answer another purpose, namely, admitting a portion of vapour into the house. Over such cisterns a flooring of bricks is formed, supported upon cast iron bearers, on which the plants are set. Some have recommended stone pavement for this purpose, and others have used boarding, but neither of these are so well calculated for the transmission of heat, as twelve inch tiles. In Stothart's description of this kind of heating, published in the first volume of the Hort. Soc. Trans., second series, it is recommended, that over a flooring of tiles laid without mortar, a bed of broken stones or bricks, about a foot in thickness, should be laid, broken small, so that those towards the top may not be greater in diameter than about two inches, over this is placed a covering of coal ashes, into which the plants are to be plunged.

As we do not advocate the principle of plunging plants in pots, unless under extraordinary circumstances, we confess ourselves at a loss to divine the utility of either the stones or coal ashes in this operation.

Steam has also been advantageously applied to heat water contained in tubes laid through plant houses, in a similar manner to flues or hot water pipes. The rationale of this plan is to heat a volume of water by means of steam, to a certain temperature, which will, for a considerable length of time afterwards, continue to give out its heat in a very gradual and gentle manner. As this appears to us to be one of the most rational modes of applying steam as a medium to heating hot houses, we shall quote the following account of it from the last edition of the Encyclopedia of Gardening. "It is well known," says the intelligent compiler of that valuable work, "that, by the common hot water apparatus, the heating

of an extensive and unconnected establishment of houses by one fire, is impracticable in most cases; but, in the mode here represented, the extent of application is in a manner unlimited, whatever be the number or situation of the houses requiring heat. It likewise combines all the advantages of steam as a conductor of heat, with that of a bulk of water as a retainer. The water pipes are eight inches in diameter, and about twenty eight feet long. The steam pipe of one inch in diameter, entering at the centre of one end, and proceeding in rather an inclined direction to the other, is then returned, still inclining, and passed out at the bottom of the bore, immediately under the place where it entered. It is then formed into a siphon, about three feet deep, whence the condensed water is conveyed away. A smaller pipe is also connected with the top of the large one, to receive the increase of water by expansion when heated, which, as the large pipe cools, returns into it again." Under the line of these tubes is a hollow flue or air chamber, and over this is another flue or chamber, in which the water pipes lie. "The air being admitted from the air chamber underneath, through an opening extending the whole length of the pipes, and passing through the upper chamber on each side of the pipes, is discharged through the grating" in the floor "through the house. Shallow cisterns are connected with the upper part of the pipes, about eighteen inches from each other, by means of hollow screws, which admit the water to pass to and fro reciprocally; the capacity of the cistern is more than sufficient to receive the increased bulk of the water, which expands when heated, and returns again into the pipes as the water cools." The direction of the pipes upon this principle is similar to the generality of hot water pipes, viz., passing along the front of the house, turning round at the ends, and continuing along parallel to the back wall. "The external diameter of the front pipes is thirteen inches, and of the back pipes ten inches and a half; each set of pipes is divided in the middle of their length, except that the nearest division of the front pipes return about half way round, the end being in length more than sixty feet. These water pipes have one inch and a quarter steam pipe, extending in them their whole length, and returning again, preserving a regular inclination throughout. The back pipes have steam pipes one inch in diameter, passing through them in a similar way, and the feeding pipes are so arranged that each division may be heated separately, or in conjunction with the rest. Another advantage attending this mode of applying heat is, that as no returning pipes are necessary as in the common hot water apparatus, the bulk of water is doubled, with the same extent of heating surface, and the returning power of the apparatus is



doubled accordingly. The cisterns are farther serviceable in regulating the humidity of the house, which can be done with the greatest accuracy by attending to the covers."

Several other modes of heating by steam could be mentioned, but as they appear to us to possess no particular merit over those already noticed, we think it superfluous to allude to them. The most complete and scientific steam apparatus hitherto erected in this country for heating plant houses, is that of his Grace the Duke of Northumberland, at Sion House; this was erected entirely under the superintendence of the late Mr. Tredgold, a civil engineer of great professional attainments, who was cut off in the prime of life, a loss to all who had the pleasure of his acquaintance, as well as to science.

## HOT WATER APPARATUS.

ECONOMY and simplicity in all improvements connected with domestic or horticultural affairs ought to claim our particular attention, and of all the improvements of which late years have been so productive, we know none of greater importance than that of heating by means of hot water.

“Neither the capabilities,” says Mr. Hood, in his excellent treatise, “of this method of warming, nor the various useful purposes to which it is applicable, are at present fully appreciated. There are no buildings, however large, to which it cannot be advantageously adapted, nor any that present insurmountable difficulties in its practical application. It is an invention yet only in its infancy, but which gives promise of a maturity that will confer the greatest advantages where its employment is the most extensive.”

It appears, from undoubted authority, that the idea of heating by this means was, to a certain extent, understood and applied in France, prior to 1777, by M. Bonnemain, a physician of some eminence, as appears from the articles *Assainissement*, *Chaleur*, *Incubation*, in the *Dictionnaire Technologique*. Bonnemain’s attention seems to have been drawn to this mode of attaining a steady and moderate degree of heat, with a view to apply it to the process of hatching chickens, a profession he carried on very successfully for some years in the neighbourhood of Paris, and there is little doubt but that he took the idea from an art long practised in Egypt of hatching chickens in ovens built for that purpose. His mode of hatching chickens by the aid of hot water is described in *Gill’s Technological Repository* for February, 1828. M. Chopineau is stated to have employed hot water for a similar purpose, but at what period is not stated, either in the *Nouveau Cours d’Agriculture*, or *The Encyclopedie Methodique*, in both of which works his process is described.

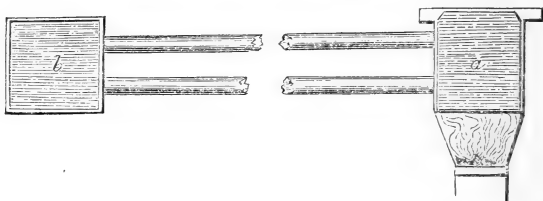
M. Bonnemain certainly applied hot water to the heating of stoves and greenhouses; but whether with complete success or not, we have no positive record. In the year 1799, we learn from *Gill’s Technological Repository*, that Mr. R. Weston purposed to apply heat to stoves by this means; but it does not appear that any progress was made from his suggestions.

The Marquis de Chabannes, according to the preface to an edition of his work, dated 1818, arrived in this country in the year 1787. In 1814, he says “the idea first struck him of constructing his caloriferæ or hot air stove; and from what we can comprehend from his rambling and flighty work, it

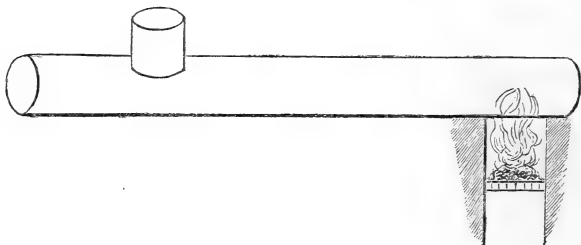
was not till a year or two afterwards, that he applied himself to the system of heating rooms, and afterwards hot houses, by means of hot water. That the Marquis, in theory, understood the principle of circulating hot water in tubes, the following quotation from his treatise will clearly shew. "The most perfect definition I can give of the circulation of hot water," he says, "is by comparing the boiler to the human heart, and the effect of caloric upon liquids, to the circulation of blood in our veins. The fire is the power which gives motion to the water, as the admission of oxygen into our lungs causes the circulation of our blood. A pipe is placed at the top, which may have any length or winding, but must finally return to the bottom of the boiler. The caloric which passes into the liquid, rises to the upper pipe and communicates itself to the liquid in it, which loses that heat as it flows through the pores of the metal, or a reservoir which may be placed in its passage for the purpose of extracting it, becomes gradually cooler, and in that state pressing on the rarified pipe which issues from the top of the boiler, re-enters at the bottom in proportion to what goes out above, thus causing a continual circulation, and the liquid coming in contact with the fire at a colder temperature, (and besides with friction), extracts a still greater portion of caloric." Whether he was the inventor of the plan he lays down, however, does not so clearly appear. Our opinion is, that he had no share in the invention, but only acted upon the suggestions thrown out by Bonnemain and others; for we find by the following passage translated from *Encyclopedie Methodique*, that Bosc witnessed some experiments in 1816, or before that period. "I witnessed," he says, "some trials made in the gardens of the Museum, of heating the hot houses by means of copper pipes filled with hot water incessantly renewed. But that plan was given up, because the heat was found, in all weathers, too equal in degree, and too weak during frosty weather." So it would appear, that in France at least, the theory had been for some time known, and it is not improbable that Chabannes, who was little better than an adventurer, took the credit of all he had learned in France to himself.

It also appears, that however he might understand the theory, in its application he was not so successful; for with all the advantages attending so important a discovery, and the great pains he took to make his theory known to the public, it remained almost unknown until about the year 1822, when it was brought most completely into practical operation by William Atkinson, Esq., in his hot houses at Grove End, Paddington, and afterwards in several gardens in various parts of England, under his immediate inspection. Mr. Atkinson's original apparatus consisted in connecting

a boiler, as represented in the accompanying engraving, with a fire beneath it, with a reservoir, by means of two iron pipes, the top one to carry the hot water to the reservoir, the other to carry the cold water back again to the boiler. A great deal has been also said of the discoveries of the



late Mr. Anthony Bacon, in regard to hot water, as applied to hot houses. We know, upon unquestionable authority, that Mr. Bacon did not know of, nor did he believe in the principle of circulation, until it was explained to him by Mr. Atkinson. We made a journey, in 1828, to Mr. Bacon's gardens at Abearnen, in Glamorganshire, for the express purpose of seeing his operations, and there saw his original apparatus, which he never could bring into any degree of useful action. His latest improvements were to be seen in a greenhouse attached to his mansion, and we had the authority of his gardener (who appeared to be a sensible well informed man), for stating that they were so defective, as to be incapable of resisting the frost, although there was at the time (November) a fire under the boiler which consumed nearly a quarter of a ton of coals daily.



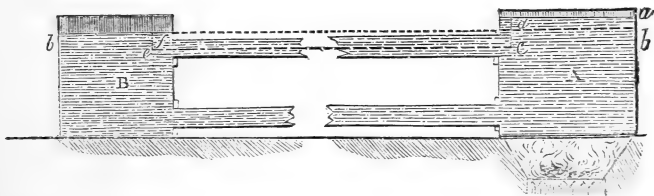
Mr. Bacon's first apparatus consisted simply of a piece of large cast iron pipe, closed at both ends, about twelve feet long, as represented in the accompanying diagram, with an open tube near one end for the purpose of supplying it with water. The fire was applied under one end of the tube, which, presenting so small a surface to its action, was long in

heating, and the waste of fuel enormous. When it did become heated so as to boil, the water flowed over at the top of the open tube. Finding that this plan did not answer his expectations, Mr. Bacon had a tin model made with boiler and reservoir, as in the ordinary one of the present day, but with only one pipe; and so pertinaciously did he adhere to his favourite theory that, till he saw Mr. Atkinson's models in operation at Grove End, he would not believe but that every useful purpose would be effected by one pipe only.

We have been led into this slight digression, because we know the pains that has been taken to deprive Mr. Atkinson of the merit of bringing this mode of heating into practice, and to divide the merit between the Marquis de Chabannes and Mr. Bacon, neither the one nor the other having been able to apply it to the purposes to which it is now so generally applied. The former, as we have already stated, acted upon the discovery of Bonnemain and others, and the latter neither knew its theory nor application.

The most scientific, and at the same time the most clear and comprehensive explanation of the principles of heating by hot water hitherto published, is in a communication to the Horticultural Society, and published in their Transactions, Vol. VII., by the late Mr. Tredgold the civil engineer, which we regret that our limits will not admit of giving at length. The following quotations from that excellent paper will be found useful.

"In order to develop the principles," says Mr. Tredgold, "on which a hot water apparatus acts, we may select the simple case of two vessels placed on a horizontal plain, with two pipes to connect them, the vessels being open at the top, and the one pipe connecting the lower parts of the vessels and the other their upper parts.



"If the vessels and pipes be filled with water, and heat be applied to the vessel A, the effect of heat will expand the water in the vessel A, and its surface will, in consequence, rise to a higher level (*a*), the former general level surface being *b b*. The density of the fluid in the vessel A will also decrease in consequence of its expansion; but as soon as the

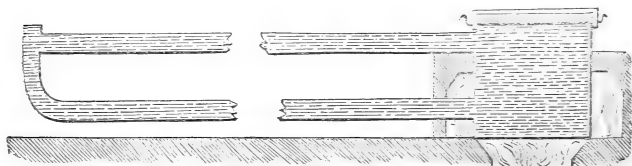
column (*c d*) of fluid above the centre of the upper pipe is of a greater weight than the column *f e* above that centre, motion will commence along the upper pipe from A to B, and the change this motion produces in the equilibrium of the fluid, will cause a corresponding motion in the lower pipe from B to A, and in short pipes the motion will obviously continue till the temperature be nearly the same in both vessels, or if the water be made to boil in A, it may also be boiling hot in B, because the ebullition in A will assist the motion."

Here Mr. Tredgold goes at some length into an investigation of some of the most important points relating to motion that requires attention in practice, which want of space compels us to pass over. We cannot, however, refrain from making the following quotations: "From the common principles of hydrostatics and the equations we have obtained," says Mr. Tredgold, "the following practical deductions may be derived.

"1st. The more expansible the liquid is, by a given change of temperature, the greater will be the velocity.

"2nd. All other things being the same, the velocity will be increased in proportion to the square root of the depth of the boiler, therefore, in a boiler four times as deep, the velocity will be doubled.

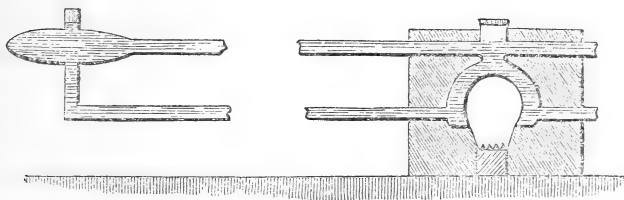
"3rd. If there be sufficient service of pipe for the object required, a reservoir is not necessary to the motion of the water: a simple bent pipe as in the annexed diagram, being all that is essential to motion; the reservoir is only to receive a hot mass of water to maintain the heat after the fire has gone out.



"4th. If a boiler has sufficient surface to receive the effect of the fire, and the whole apparatus contains as much water as will convey the heat from the fire to the heating surface in the time corresponding to its velocity, its capacity need not be further increased, except as a reservoir of heat to act when the fire ceases to burn.

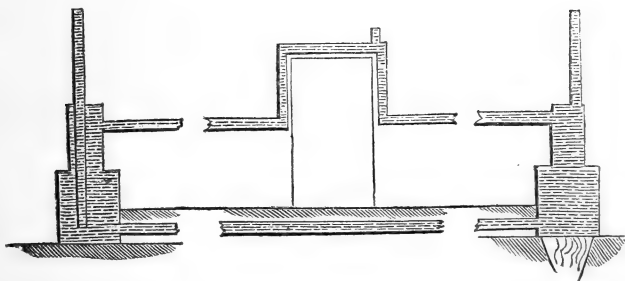
"5th. Where heat is required only during the action of the fire, a large surface in proportion to its capacity may be used with advantage, to give

off heat over the descending pipe, as in the annexed figure ; cooling in this manner will increase the velocity.



“6th. The aperture of the upper pipe should not be more than about one inch below the surface of the water, or as much as prevents it drawing air, in an open boiler, but the lower it is below that, the less effect will be obtained ; the lower pipe should enter the boiler where it has less tendency to cool and check the fluid rising to the upper pipe from the fire surface.

“7th. In a close boiler a pipe, at any distance from the boiler, may rise to any height and descend again, but it must neither rise twice nor dip after leaving the boiler ; when it is necessary to raise it, there should be an open pipe inserted at each extremity of the height of the rise ; advantage has been taken of this circumstance to avoid door ways, as in the annexed diagram.



“8th. A certain quantity of motion would be obtained by a single horizontal pipe between any points except the bottoms of the vessels ; but

the nearer to the surface the more motion will be obtained, and with one pipe there must be a double current in it." This was the principle contended for by the late Mr. Bacon, who mistook the double current, that is, the hot water flowing along the top part of the pipe and the colder returning to the boiler near its lower side, and calculated that water as a conductor of heat, by one particle giving off its heat to the next, it would in time heat the whole column contained in the pipes, which no doubt it would, but not with rapidity. This doctrine is contrary to the rules laid down by the late Count Romford, who considered water as a nonconductor; but the experiments of Dr. Thompson, Mr. Nicholson and others have proved to the contrary.

"9th. The retarding effect of friction is directly as the length, and inversely as the diameter of the pipes; it is also increased by every bend and angle in the pipes."

The thirteenth paragraph of this excellent paper thus proceeds:

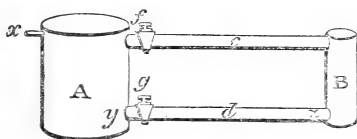
"13th. Having considered the circumstance necessary to the motion of the fluid in pipes, the next inquiry must be the quantity of heat a liquid can convey in a given time, and the quantity of surface required to communicate it to the air of the house. It is a fact not so generally known as it ought to be, that if we communicate a certain quantity of heat to a liquid, it will give out the same quantity again in cooling to its former temperature, less nor more it cannot afford. It is equally true, that with the same temperatures, equal and like surfaces give off equal quantities of heat to air, and consequently, the quantities of heat exchanged under given circumstances, are measurable quantities, and this subtile element is brought within the domain of science."

The conclusions arrived at by Mr. Tredgold on this subject are, that for the generality of hot houses, double the number of feet contained in the area of the surface of glass will be equal to the number of cubit feet of air, which that surface (that is, the surface of pipes,) should heat per minute when in full action; but the surface of the apparatus will give off heat of different degrees of temperature according to the materials they are formed of and the different liquids they are charged with. Thus thirty two and a half feet of pipe charged with linseed oil, will heat a space equal to that heated by one hundred and six feet when brine is employed, or one hundred and sixteen feet when clear water is used. The advantage, therefore, of using a fluid capable of bearing a high temperature without boiling is very considerable in lessening the quantity of surface of pipe required, but oil is of too inflammable a nature to be used for general purposes with safety. And in regard to the materials the pipes are



formed of, it appears that earthenware, or bright tinned iron pipe require to be of greater size than cast iron ones, to produce a like effect.

The cause of the circulation of hot water in pipes has been variously explained, and the theory laid down by Tredgold, before alluded to, was considered the most rational and complete. The correctness of that opinion has, however, lately been called in question by Mr. Hood, who observes that the theory of Tredgold will not account for the circulation of water, under all circumstances, and every variety of form of the apparatus; and as the cause of motion must be the same in all cases, any explanation which will not apply universally must necessarily be erroneous.



In order to explain his theory Mr. Hood proceeds, "let us suppose heat to be applied to the boiler A," in the accompanying diagram. "A dilatation of the volume of the water takes place, and it becomes lighter; the heated particles rising upwards through the colder ones, which sink to the bottom by their greater specific gravity, and they in their turn become heated and expanded like the others. This intestine motion continues until all the particles become equally heated, and have received as much heat as the fuel can impart to them. But as soon as the water in the boiler begins thus to acquire heat, and to become lighter than that in the opposite vessel B, the water in the lower horizontal pipe *d*, is pressed with a greater weight at *z* than at *y*, and it therefore moves towards A with a velocity and force equal to the difference in pressure at the two points *y* and *z*. The water in the upper part of the vessel B would now assume a lower level, were it not that the pipe *c* furnishes a fresh supply of water from the boiler to replenish the deficiency. By means of this unequal pressure on the *lower* pipe, the water is forced to circulate through the apparatus, and it continues to do so as long as the water in B is colder, and therefore heavier, than that which is in the boiler; and as the water in the pipes is constantly parting with its heat, both by radiation and conduction, while that in the boiler is as continually receiving additional heat from the fire, an equality of temperature can never occur, or else *f* it did, the circulation would cease."

“We see, then,” says Mr. Hood, “that the cause of the circulation is the unequal pressure on the lower pipe of the apparatus, and that it is not the result of an alteration which takes place in the level of the water, as has been erroneously supposed.”



## HOT WATER BOILERS.

WE consider that to arrange a complete hot water apparatus, some attention ought to be paid to adapt the boiler to the circumstances of the case. This we believe has been too little attended to, and of course some of the features attending heating by this means may be safely attributed to a disregard to some fixed principle in this respect. On this subject Mr. Hood, already quoted, observes, "In adapting the boiler to a hot water apparatus, it is not necessary, as is the case with a steam boiler, to have its capacity exactly proportional to that of the total quantity of pipe which is attached to it; on the contrary, it is sometimes desirable even to invert this order, and to attach a boiler of small capacity to pipes of large size. It is not however meant, in recommending a boiler of small capacity, to propose also that it should be of small superficies; for it is indispensable that it should present a large surface to the fire, because, in every case, the larger the surface on which the fire acts, the greater will be the economy of fuel, and therefore, the greater will be the effect of the apparatus.

The following figures of boilers are those in common use, and each has of course its peculiar advantages and defects.

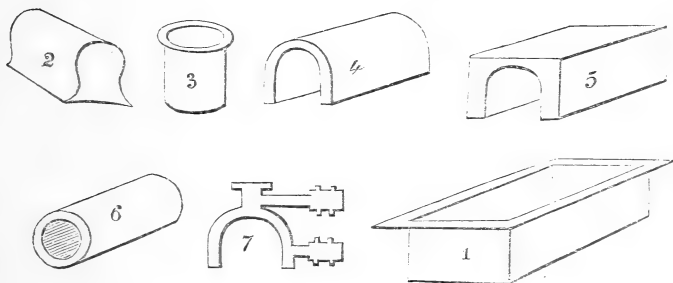
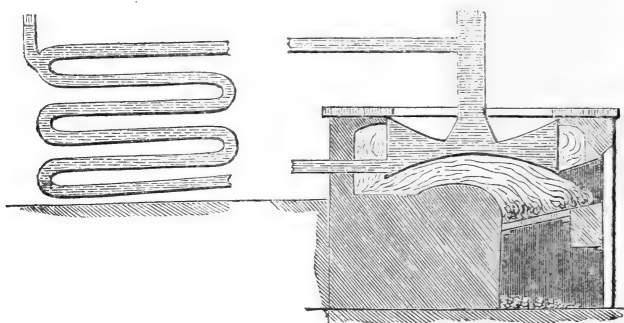


Figure 1 is the form first used by Mr. Atkinson, and in many cases such a form is still used by that gentleman and by others. Its advantages, like those of 2 and 3, are, that when the water in them is once heated, they retain their heat longer. Their disadvantages, on the other hand, are, that although it is true in fact that such boilers retain their heat longer than some others do, yet that is not a sufficient reason for their

adoption, for the same effect can be accomplished by using larger sized pipes, or by having a reservoir at one end of the apparatus so contrived, by being enclosed in brick work or other non-conducting materials, as will prevent such reservoir from giving off much of its heat by radiation, and the heat so retained in such reservoir will give out its heat to the pipes as the heat entering them from the boiler decreases. Or if the communication between such a reservoir and the pipes be cut off by a stop cock, the maximum temperature can be attained in the pipes in a much shorter period than if the whole volume of water had been contained in the boiler.

The advantages of small boilers, such as Nos. 4, 5, 6, and 7, and also of the annexed fig., providing that an extreme be not fallen into, is, that



boilers containing a small quantity of water become sooner heated, require less consumption of fuel, and the rapidity of the circulation is more rapid from them than in others.

“There is,” says Mr. Hood, “no advantage whatever gained by using a boiler which contains a large quantity of water; for as the lower pipe brings in a fresh supply of water as rapidly as the top pipe carries the hot water off, the boiler is kept always absolutely full.”

The capacity of the boiler and its operations depends a great deal on the extent of its surface exposed to the action of the fire, and this surface should in all cases be proportioned to the quantity of pipe intended to be heated by it. To ascertain this, the following simple data has been laid down by Mr. Hood, “reckoning the surface which a steam boiler exposes to the fire, at four square feet for each cubic foot of water evaporated per hour, and calculating the latent heat of steam at one thousand degrees, we shall find that the same extent of boiler surface which would evaporate

a cubic foot of water, of the temperature of fifty two degrees, into steam, of which the tension is equal to our atmosphere, would supply the requisite heat to two hundred and thirty two feet of pipe, four inches in diameter, when the temperature is to be kept at one hundred and forty degrees above that of the surrounding air. The following calculations showing the surface which a boiler for a hot water apparatus ought to expose to the fire, will be found useful."

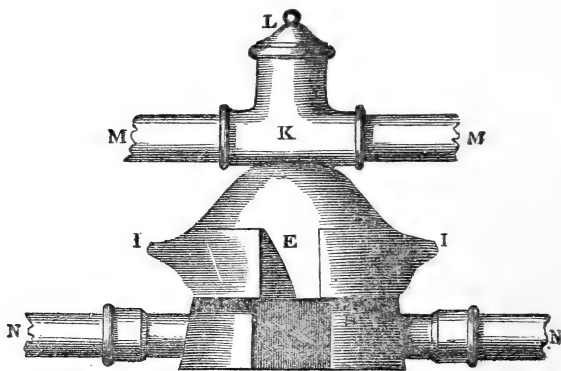
Surface of Boiler exposed to the fire.	4-in. Pipe.	3-in. Pipe.	2-in. Pipe.
$3\frac{1}{2}$ square feet will heat	200 feet	or 266 feet	or 400 feet
$5\frac{1}{2}$ .. ..	300	400	600
7 .. ..	400	533	800
$8\frac{1}{2}$ .. ..	500	666	1000
12 .. ..	700	933	1400
17 .. ..	1000	1333	2000

"A small apparatus ought, perhaps, to have rather more surface of boiler, in proportion to the length of the pipe, than a larger one; as the fire is less intense, and burns to less advantage in a small than in a large furnace. It depends, however, upon a variety of circumstances whether it will be expedient to increase the quantity of pipe in proportion to the surface of the boiler, beyond what is here stated; for although many causes tend to modify the effect, the above calculation will be found a good average proportion, under ordinary circumstances. The effect depends greatly upon the quality of the coals, the height of the chimney, the rapidity of the draught, the construction of the furnace, and many other particulars; but it will always be found more economical, as regards the consumption of fuel, to work with a larger surface of boiler at a moderate heat, than to keep the boiler at its maximum temperature."

As the data from which the above calculations are made assumes the difference between the temperature of the pipe and the space to be heated to be one hundred and forty degrees, (the pipe being two hundred degrees and the air sixty degrees,) it consequently follows that if the temperature be reduced either by a diminution of heat in the apparatus, or by the air in the space to be heated being higher, then, the same surface of boiler will be enough for a greater length of pipe. For example, if the difference of temperature between the water and the air be more than one hundred and twenty degrees, then the same surface will heat one sixth more length of pipe, or if the difference of these temperatures do not exceed one hundred degrees, that one third more length of pipe may be heated by the same means.

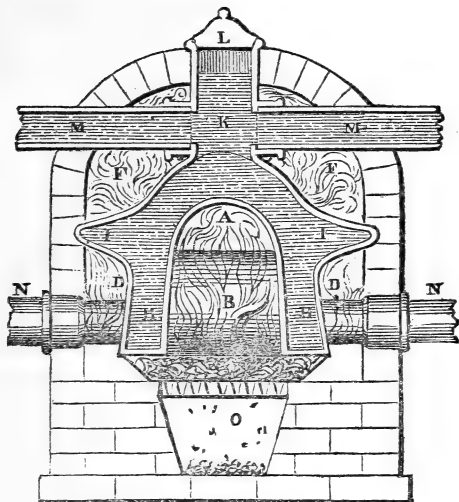
The only other improvement in heating houses to which we shall now call attention, is a boiler invented by Mr. Thomson of the Sion nursery at Norwood. This gentleman states in a communication prepared for this work, that having devoted considerable attention to this subject, and tried many kinds of boilers, he turned his attention to forming one that would combine the various requisite qualities of economy of fuel, with a sufficient degree of heat, and which would not involve such constant attention as the boilers in common use require.

The advantages of the present invention consists in the great surface the boiler presents to the action of the heat, and the introduction of a check draft and flange filled with water to divide the flues. Another and a very important advantage is, that between the double doors and the bars of the furnace, there is a piece of iron placed, one foot three inches long, by one foot wide, which acts as a carbonizing plate, so that when the fire begins to burn strong enough to heat the iron, nearly the whole of the smoke is consumed.

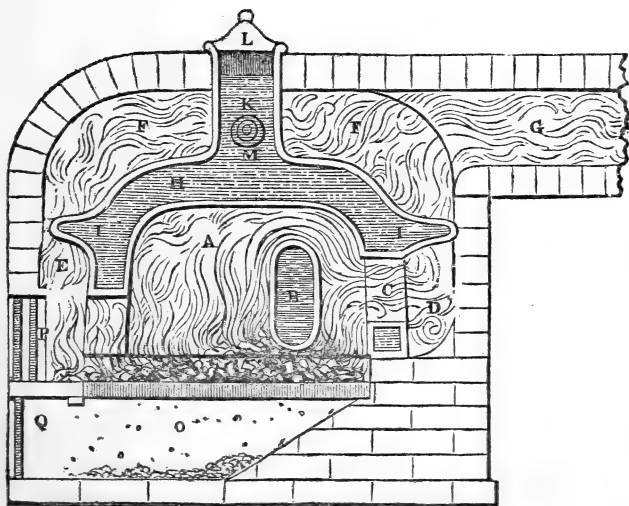


Front Elevation.

But our description will be better understood by reference to the figures, the first of which represents the front elevation of the apparatus, the various parts of which are indicated by reference letters in the accompanying engravings.



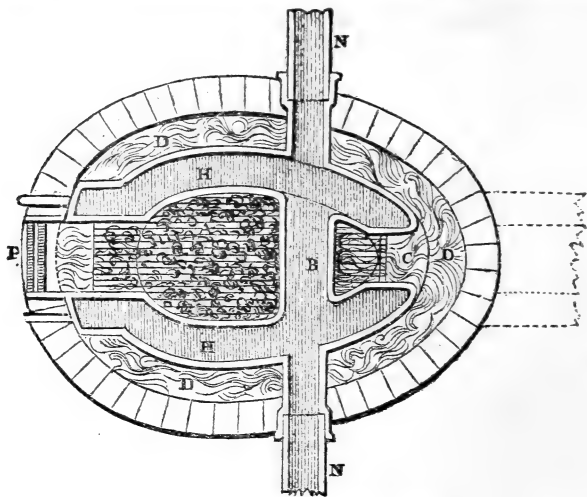
Transverse Section,



Longitudinal Section.

The second figure represents a transverse section across the boiler and furnace, A being the furnace in which the fuel is placed, which is entirely surrounded with the boiler, except on the under side. B is a check draft, over which the heat, flame, and smoke pass to a small aperture C, in the back of the boilers, which is represented in figure 3, communicating with the flues D D, which surround the lower part; these flues, D D, unite and pass through an opening (E, figure 1) in the flange, over the furnace door to the flue F F, represented in figure 3; this flue surrounds the upper part, and terminates at the brick flue G, which is furnished with a damper to regulate the draft, and there will scarcely be a particle of heat lost by continuing this flue to the most distant part of the building.

The boiler H in figure 4, is in the form of an egg. It is represented in the plan with a chamber all round, connected by the check-draft B, and surrounded with the flange I fig. 1, which divides the upper and lower flues. K is a cylindrical chamber on the top of the boiler, on which is the iron cap I fig. 1, either fixed or moveable, as may be required; M M are the two outlet

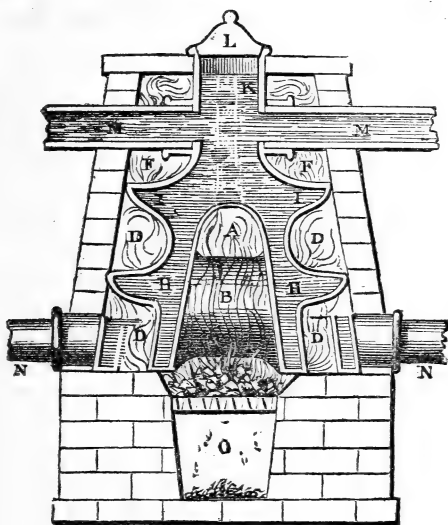


Ground Plan of the Furnace and Boiler.

pipes, communicating with the upper part of the boiler, through which the hot water circulates. After passing to the outside of the brick work, the pipes are ramified into as many branches as may be required; N N are the two return pipes which enter the lower part of the boiler; O is the ash pit, with a door, Q, to regulate the draft. The furnace has double



doors, P, to exclude the external air. The boilers represented in these four figures are intended for houses of moderate dimensions, and the manufacturer states them to be the most economical yet made.



Section of a Circular Boiler.

Figure 5 represents the section of a circular boiler, with an additional chamber and flue surrounding the lower part; this boiler is circular, and only two feet eight inches in diameter across the bottom, in the clear of the brick work, and three feet high. "During each winter," says Mr. Thomson, "I made use of this boiler, with which I heated four hundred and forty eight feet of three and four inch pipe, which warmed two large greenhouses or stoves, sixty feet by sixteen, and sixty feet by fourteen, together with two pits sixty feet by eight, and sixty feet by six. The whole were kept up at their respective temperatures during the severest part of last winter without any difficulty, the only fuel required being cinders or very small coke, with the refuse cuttings from the nursery, and at no time did it require more than four baskets of such fuel in the twenty four hours,"

“Having devoted considerable time and attention to heating houses with hot water, and watching the thermometer, both out of doors and in the house, for several years, but more particularly during the last and present year, and by accurate calculations of the number of feet of surface glass exposed to the weather,” Mr. Thompson adds, “I am enabled to estimate very correctly the number of feet of surface of pipe required to command, with all extremes of weather, any specified degree of heat, either in the stove or greenhouse: the want of proper attention to this highly important part, namely, calculating the radiating surface of glass, and then estimating the proper quantity of pipe necessary to produce certain degrees of heat in all weathers, is the cause of many of the complaints against the system of heating by means of hot water.”

### FURNACES ADAPTED FOR HOT WATER BOILERS.

As a much more moderate and uniform heat is required for the proper working of a hot water boiler, than for many other purposes—the steam engine for example—a furnace, so constructed that a moderate heat may be obtained, and by which combustion may go on slowly, is all that is required.

The following excellent directions on this subject, by Mr. Hood, are worth attention. “The heat should be confined, as much as possible, within the furnace, by contracting the farther end of it, at the part called the throat, so as to allow only a small space for the smoke and inflamed gases to pass out. The only entrance for the air should be through the bars of the grate, and the heated gaseous matter will then pass directly upward to the bottom of the boiler, which will act as a reverberatory, and cause a more perfect combustion of the fuel than would otherwise take place. The lightness of the heated gaseous matter causes it to ascend the flue, forcing its passage through the throat of the furnace with a velocity proportional to the smallness of the passage, the verticle height of the chimney, and the levity of the gases arising from their expansion by the heat of the furnace.”

“In this arrangement the whole of the air which supports the combustion passes through the fire below, and any air admitted at the furnace door, between the fuel and the boiler, reduces the intensity of the heat.” We ought here to observe that the most extravagant waste of fuel arises from air being admitted in this manner, either from improper furnace doors or from their being left open, or partially so, all cases of the most common

occurrences. It should be a rule from which we know of only one exception, that no air should be admitted into the furnace, beyond that which is absolutely necessary to cause and to maintain combustion, and even that quantity should be made to enter the furnace at the bottom, and to pass through the volume of fuel undergoing combustion.

The solitary exception above alluded to is in the case of coal being used, which emits a more than usual quantity of flame, as some of the Staffordshire and most of the Scotch coal do. In such cases air may be advantageously admitted over the fuel and will aid the more perfect combustion of the gaseous matter with which such coal is charged.

The following table and practical remarks have been laid down by Hood. "The quantity of coal which is required to be burnt in each particular furnace must determine the area of the bars, and as this has been ascertained experimentally for steam boilers it is merely necessary to reduce it to a standard suitable for a hot water boiler. This data being obtained, there will be no difficulty in determining the proper size of furnaces, which is, we think, of much importance. Supposing the ordinary kind of furnace bars to afford about thirty inches of opening for the air in each square foot of surface, measured as the bars are placed in the furnace, and allowing half inch openings between the bars, when the bars themselves are about one inch and a half wide, then the relative proportions between the area of the bars and the length of the pipe should be as follows :—

Area of Bars.		4-in. Pipe.	3-in. Pipe.	2-in. Pipe
75 square inches will supply		150 feet	or 200 feet	or 300 feet
100 .. ..	..	200	266	400
150 .. ..	..	300	400	600
200 .. ..	..	400	533	800
250 .. ..	..	500	666	1000
300 .. ..	..	600	800	1200
400 .. ..	..	800	1066	1600
500 .. ..	..	1000	1333	2000

"Thus suppose there are six hundred feet of pipe, four inches in diameter, in an apparatus, then the area of bars should be three hundred square inches, so that thirteen inches in breadth and twenty three in length will give the requisite quantity of surface; but when it is required to obtain the greatest heat in the shortest time, the area of the bars should be increased, so that a larger fire may be produced."

"In order to make the fire burn a long time without attention," a very important consideration, and probably also to a greater extent than is usually thought in the economy of fuel, "the furnace should extend beyond

the bars both in length and breadth, and the coals which are placed on this blank part of the furnace, in consequence of receiving no air from below, will burn very slowly, and will only enter into complete combustion when the coal which lies directly on the bars have burned away."

It has been laid down as an invariable rule by a very competent judge, that no pipes should be used for this purpose of a greater diameter than four inches, nor less than three inches, unless in the case of pits or any small houses, when a very moderate temperature is to be kept up; in such a case, pipes of less diameter may be used. Larger pipes will of course, when once heated, continue to give out their heat longer than small ones, after the fire is extinguished, but they require an equal length of time and consumption of fuel to heat them. Besides, the friction is much greater in small pipes than in large ones, arising from the circumstance of the increased surface with which a given quantity of water comes in contact when passing through a small pipe, and also the greater velocity with which the circulation goes on.

Pipes should be of a uniform size throughout their whole length, unless circumstances occur subjecting that rule to deviation; this will sometimes occur when two or more departments are to be heated from the same boiler, and these are at a distance from each other. In such cases, the pipe, which is merely intended to connect the more distant parts, may be smaller in diameter, as for example, if a boiler were to be placed equidistant from four pits, a smaller pipe might be laid under ground, or otherwise, to convey the water to the pipe within the pit, which latter is to give off heat; the smaller pipe from the increased velocity of the water passing through it, would lose but little of its heat during its passage. All alterations in the size of pipes, either by enlarging or contracting their diameter, effects the velocity of the circulation in a greater or less degree. Venturi, discovered that the velocity of a given quantity of water would be effected by enlargements in the pipes to the following extent.

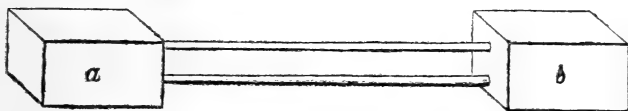
A straight pipe in	109"
A pipe with one enlargement required	147"
" " three " " "	192"
" " five " " "	240"

In regard to the quantity of pipe required to heat hot houses, Mr. Hood has laid down the following scale:—"For greenhouses, conservatories, and such like buildings where the temperature is required to

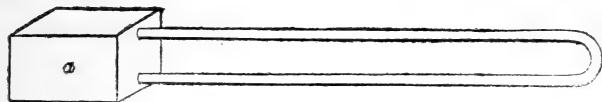
be kept at about sixty degrees, dividing the cubit measurement of the building by thirty will give the required quantity of pipe, and for forcing houses where it is desired to keep the temperature at seventy to seventy five degrees, we must divide the cubic measurement of the house by twenty, but if the temperature be required as high as seventy five degrees or eighty degrees, then we must divide by eighteen to obtain the number of feet of four inch pipe. If the pipes are to be three inches diameter, then we must add one third to the quantity thus obtained, and if two inch pipes are to be used we must take double the length of four inch pipe."

## HOT WATER APPARATUS.

Having thus far given a brief detail of the leading points in the theory and practice of heating by means of hot water, we shall now give as briefly as possible the essence of what we deem to be the best method recommended for use, and take them as near as possible in the order in which they stand as to priority.



Atkinson's original plan consisted in simply connecting the boiler *a*, with the reservoir *b*, by means of two horizontal tubes, and sometimes without a reservoir, as in figure 2, the uppermost intended for the heated

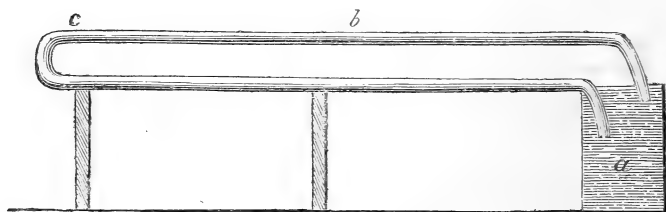


water to flow through towards the reservoir, and the lower to conduct it, when cooled, back again to the boiler, entering it near the bottom. The boiler and reservoir had covers, which could be taken off or put on at pleasure, the former being of wood, which, being a nonconductor of heat, prevented too great an escape of heat at the end, which naturally would be the warmest part of the house; the latter was of cast iron, but was very seldom used. For all ordinary purposes this apparatus was found,

when first erected, in 1822, to answer every useful end, and upon this very principle many are still erected. As this mode is only adapted to situations where the boiler and reservoir is upon a level, the same ingenious architect constructed others with fixed covers, and also with a perpendicular pipe, elevated to the highest level to which the water was intended to be carried, and by these means he could cause the water to circulate to any required height. This he has exemplified in a very satisfactory manner at his mansion of Silvermeere, near Cobham, where the boiler is placed in a cellar, and the principal rooms and passages warmed by its means.

It has been recommended, that in erecting this particular variety of apparatus, the lower or returning pipe should be inclined so as to allow a gradual fall of the water in its return to the boiler. This plan at first sight appears very plausible, but the principle of its action is, in fact, entirely erroneous, and appears to arise from considering the subject as a purely simple case of hydraulics, instead of the compound result of hydrodynamics. The experiments made by Hood led him to the conclusion that there must, under all circumstances, be a positive loss of effect by inclining the pipe from the farther extremity towards the boiler, as we have elsewhere shewn.

Messrs. Kewley and Fowler appears to have each invented about the same period what the former calls his siphon principle, and the latter his thermosiphon, which is in principle almost the same thing, and by means of which water can be carried in any direction. The former exhibited his apparatus in the nursery of the late Mr. Colveile, in 1826, and the

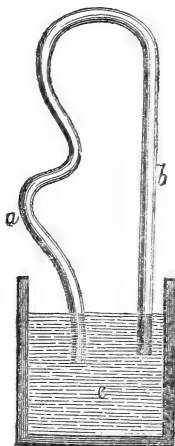


latter took out a patent in 1829. Nothing can act better than Kewley's siphon, and we believe that it is at present by far the most popular of all other modes. A glance at the annexed diagram will explain its form and

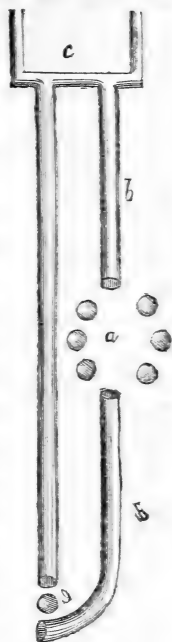
principle. From nearly the top of the boiler, *a*, (which is without a cover) the upper leg of the siphon, *b*, rises and proceeds to the extremity of the space to be heated; through this upper pipe the hot water flows and returns by the lower leg and enters the boiler at the top, but is continued downwards to near the bottom of it. At the extremity of the pipe, as at *c*, a small hole is made in the tube, to which an air pump is applied to empty it of air, and as this process goes on, the water flows into them and occupies the space. Next to Atkinson's original plan, this is the simplest in operation, but requires greater nicety in the erection, and those intending to adopt it cannot do better than employ the inventor, who, besides being an honest and unassuming man, is a most ingenious and clever engineer.

The thermosiphon will be readily understood by a reference to the annexed diagram, and is thus described in the Gardener's Magazine, vol. X., p. 453, after explaining the principle, which is by employing the power of the fluid in descending one leg of the siphon to draw up hot fluids in the other; by this means, hot fluids will circulate from one boiler to another, or from one vessel to another, through pipes of various forms and lengths, "Supposing the water of a uniform temperature in both legs of the siphon, *a b*, no circulation would take place; but supposing it to cool sooner in the long leg *a*, than in the short leg *b*, then the equilibrium would be destroyed, and the water in the long leg *a*, would descend and draw up hot water through the short leg *b*, and this circulation would continue as long as the water at *c* was maintained at a temperature above that of the surrounding atmosphere. We consider this method better adapted to the purpose of raising water to heat baths and dwelling houses than that of hot houses, although, no doubt, it can be applied to the latter purpose also.

The next in order, we may place that of Mr. Week's, which is intended to cause the water to circulate below the level of the boiler if required; but for this purpose it is necessary to raise the water to a height above the level of the boiler equal to the distance which it is intended to sink it below that point. This may be done in any closed boiler, with a tube proceeding from its cover, or in any boiler of a height above the fire, equal to the depth below



it, to which it is intended to circulate the water, and will be readily understood by a reference to the annexed diagram. In this figure *a*, is a section of the fire place, which, instead of having a common boiler over it, is surrounded by cast iron tubes. The uppermost of these tubes communicates, by means of the upright tube *b*, with the open vessel *e*, and the lowermost is connected in a similar manner by means of the tube *d*, with one or any number of tubes under the level of the boiler at *e*. The uppermost of the tubes at *e* is connected by the tube *f*, with the open vessel *c*. Now, all these tubes being so connected as to admit of water circulating freely through them, when a fire is made in *a*, the heated water ascends by its refraction into the open vessel *c*, and its place in the tubes round the fire is supplied by the colder water from *e* through *d*, the heated water descending to supply its place from the open vessel *e*, by the tube *f*. The limits of the depth to which the water will circulate below, is that of the height of the open vessel above. To produce this circulation, it is not necessary that the water should boil, for as every heated particle will ascend to the open vessel *c*, its place must be supplied by a cold particle from *d*. When the fire is urged so as to raise the water in the open vessel nearly to the boiling point, the circulation goes on with the greatest rapidity. The substitution of tubes round the fire for a boiler over it, is by no means necessary for the success of this plan, though by tubes the rapidity of the circulation is greatly increased. Any close boiler with the tube *b* attached to its cover, and communicating with an open vessel fixed at any height, such as *c*, having another tube similar to *f* fixed to it, will circulate the heated water from such vessel to a point below the bottom of the boiler, nearly equal to the balance of atmospheric pressure, or say, thirty feet below it.



The next in order of time and celebrity which we think worth noticing here, is that of Perkin's, and consists in circulating water in hermetically sealed tubes, and these of a very small size. This plan consists of a coil of wrought iron tubes about one inch in diameter, which serves the purpose of a boiler, the fire being made in the centre of the coil, not in immediate contact with them, but separated by brick work, over which the heat passes and circulates in the flue, which also contains the pipes.



From the end of the top course of pipes the water ascends into tubes arranged for its conduction through the house, and the same water, when it has given out its heat in the course of its journey, re-enters the coil again by the lowest tier of pipes, and is in its turn heated to arise again, and so on in regular order. In order to guard against the pipes exploding, which they would be apt to do if filled quite full of water, on account of the expansion to which it is liable when heated, and the tubes being securely closed at the ends, the precaution is taken to fill them only to a certain extent, and also by the use of an expansion tube, which allows of the expansion of the water in the way of high pressure steam. It would appear that this is the most powerful of all modes of heating by means of hot water, and that it may be applied to heat structures of a capacity which no other medium, steam only excepted, could accomplish. The smallness of the pipes admits of their being introduced into situations where the larger pipes of other engineers could not conveniently be admitted, and as the velocity with which the water travels is so great, it may be carried to almost the same distance as steam.

Apprehensions are entertained that the pipes used in this mode are liable to burst from a variety of causes, but Mr. Perkins asserts that all his tubes are now proved prior to being used, and capable of bearing three thousand pounds to the square inch, which appears sufficient allowance for extraordinary pressure, when we reflect that sixty pounds or seventy pounds is only necessary to be the resisting power when three hundred degrees of heat is required.

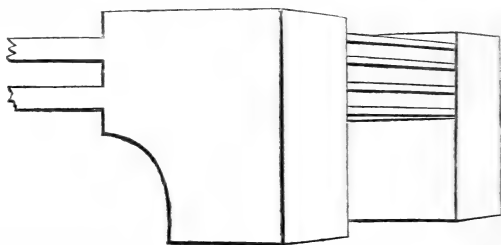
A variety of other methods of heating by hot water have been published, but as there are none of them so effectual for general purposes as those above alluded to, we will now proceed to consider the merits of one or two modes adapted for particular circumstances.

Busby's method of circulating water by the aid of machinery is described in Repertory of Patent Inventions, Vol. IV., p. 137, its principal difference from all others being in its capability of circulating water by means of an apparatus which may be compared to the wheel of a winnowing machine, this is fixed within the boiler to a perpendicular axis, which must be placed exactly over the end of a pipe which reaches from the circumference to the centre of the boiler. There is also a second pipe which reaches no farther than the circumference. These pipes are united at the end farthest from the fire, and may be made to descend or be carried to any distance and in any form. The boiler and pipes being filled with water, the circulation commences in consequence of a rotatory motion being communicated to it by the fan or circulator, which is made to revolve by the action of the

smoke and hot air in the chimney, similar to a common smoke jack ; the centrifugal force of this motion will so act against the fluid in the pipe terminating in the circumference, as to cause the water to rush down it while it draws it up the other.

By this means either hot or cold water can be made to circulate, the circulation depending on the centrifugal force, and the mouth of one pipe, being in the centre of the boiler while the other is in the circumference, a greenhouse or stove, therefore, may be heated from a boiler placed over a common fire in a garret, and the water carried downwards to the pipes or reservoir in the house. The singularity of this invention is the power it possesses of forcing hot water downwards, a result not anticipated, and also in the rapidity of the circulation which admits of tubes being used of much smaller size than usual, a matter of great consequence in some cases.

Greenhouses, stoves, &c., are sometimes heated by the waste heat of domestic fires. and as we have already shown that hot water can be made to circulate either upwards, downwards, or horizontally by adopting some of the methods already detailed, it will be evident that any greenhouse, stove, plant verandahs, or other structure may be heated either from the kitchen, parlour, or drawing room fire as may be most favourable, without the least inconvenience, and at scarcely any additional expense.



The annexed figure shows a fire place upon this principle, invented by the venerable curator of the Chelsea botanical garden, it consists of a grate surrounded by a boiler which forms the back and sides of it. The fire is intended for the usual domestic purposes, and the water heated by it is carried through the wall into the greenhouse behind, by means of a pipe which may be placed in the most convenient manner possible, according to the form, size, and circumstances of the house. The water when cooled returns again to the boiler by the lower pipe, which enters at the opposite

side. The boiler, or rather the grate, may be of any form desired, from that of the annexed figure to the most ornamental, only taking care that the parts round the fire be hollow so as to hold a sufficiency of water. The water for the supply of the boiler may be applied from without by the aid of a small pipe and funnel. This plan would be admirably calculated for heating the verandahs and balconies in front of town residences, in which, during summer, we see such a profusion of flowering plants, but which, in winter, are entirely empty or occupied with a few of the hardiest evergreens. If such balconies were furnished with glass sashes, which could be done at little expense, and these sashes fitted in about the end of October, any greenhouse plant might be kept in a good state of preservation during winter, and a sufficiency of heat admitted to them from the drawing room fire by the means just recommended.

Of all these methods of heating by means of hot water, our opinion is briefly thus:—that for ordinary purposes in greenhouses and stoves, when the level circulation can be adopted, Atkinson's original method is the best, and although, perhaps, not the cheapest in the first erection, is unquestionably so in the end.

When the circulation is to be carried over doors, or under foot paths, or indeed out of a regular level, Kewley's siphon system is the most to be preferred.

And when the greatest possible degree of heat is required and only a limited space for the apparatus, that of Perkin's is certainly the best.

For heating small greenhouses, balconies, &c., from the fire used for other domestic purposes, that of curator Anderson's is, in our opinion, the most simple and efficient one.

By any of these four methods a house, however situated, can be completely and economically heated. We have elsewhere stated our opinion, that for the ordinary purposes of greenhouses, it is scarcely worth while erecting hot water apparatus at all, where smoke flues can be built cheaper and without interfering with the internal arrangements of the house. But for stoves and other forcing houses, where a higher degree of temperature is required for three parts of the year, there can be no doubt of the superiority of hot water over every other mode, both as regards economy and convenience.

#### DIRECTIONS FOR THE MANAGEMENT OF HOT HOUSE FURNACES.

THE following excellent directions for the management of hot house fire places, that are constructed with double doors and ash pit registers, was drawn up some years ago by that eminent architect, W. Atkinson. Esq.

and printed for private distribution by that gentleman, and afterwards published in the *Hort. Trans.* The directions are so valuable, that we will give the contents of that paper at length.

“When the fire is first lighted, the ash pit door may be left open until the fuel be properly kindled; the door should then be shut close, leaving the brass register so far open as to allow sufficient air to blow the fire, but not more than is absolutely necessary to make it burn well, not violently, nor with a strong draught, for if more air be admitted than is required for a moderate brisk fire, it occasions a great waste of fuel, without increasing the heat.

“The fire place door must at all times be kept shut, and the sloping part of the iron frame of the door must be kept clear of coals, so as not to prevent the door from latching. No air must be let in at the door at any time, except when it cannot be avoided in feeding the fire. Any cold air that may get in at the fire place door is apt to rush over the fire into the flue without being heated, and that air tends to cool the flue, instead of heating it. Therefore, all the air that is necessary for blowing the fire must be admitted at the ash pit register, in order that it may get heated in passing through the fire to the flue.

“It is impossible to determine the exact opening necessary to be left in the ash pit register to admit sufficient air, as that greatly depends upon the goodness and length of the flue, and the height of the chimney. When a flue is once properly heated, the draught becomes stronger, and then a less opening in the register is sufficient to supply the fire with air. In this state about half an inch opening in the register is generally sufficient, and it should be shut quite close if it be found that the fire will burn with it in that position, as a considerable quantity of air will get in through the joints of the ash pit door.

“The best fuel for hot house fire places is about equal quantities of coal and small cinders, or braise. This is cheaper than using coals only, and keeps up a steadier fire with less smoke.

“At all times when fresh fuel is added to the fire, the hot fuel unconsumed must be pushed with an iron rake towards the further end of the bars, and fresh fuel applied immediately in the front of it, so as to fill up the space between the bars and the inner part of the frame of the double door.

“This fuel being dead between the bars and the door, protects the door from the heat of the fire, and prevents the iron from warping.

“In supplying the fire with fresh fuel, great care must be taken not to throw it over to the further end of the fire, or into the throat of the flue,

for this is often the cause of flues bursting. When coals are thrown beyond the fire after it has burnt low and the flue is hot, the heat of the brick work distils gas out of the coals ; this gas gets into the flue, and when the fuel over the fire becomes inflamed, if the flame be drawn into the flue, it ignites the gas that has been there generated, and causes an explosion ; this ought to be particularly attended to, as an explosion of gas in the flue may destroy a valuable collection of plants in a moment.

“There is also another circumstance, which renders it desirable to attend to the manner of supplying the fire with fuel. If the fresh fuel be thrown over the surface of a hot fire, it produces an immense volume of smoke and blacks. But on the contrary, when the fuel is added carefully at the front of the fire in the manner before described ; then much of the smoke given out by it is consumed in passing over the hot part of the fire.

“Besides the management of the ash pit register, the damper of the flue ought to be particularly attended to, by not opening it further than is absolutely necessary for the combustion of the fuel. The more the damper can be closed, provided the fire will burn moderately well, the more heat will be retained in the flue, without escaping up the chimney, and the less fuel will be consumed ; and when the fire is made up for the last time in an evening, the damper should be put in as far as it can be, so as only just to keep the fire alive, and in general the fire may be allowed to burn bright against the last attendance in an evening ; and then, instead of putting on fresh fuel, close the ash pit and damper completely. This will prevent any draught of cold air through the flues carrying the heat out at the chimney ; the body of heat that is in the mass of brick work of the flues, having then no other means of escape but into the house, will frequently be found sufficient for the night.

“The ash pit register should be properly attended to, and never suffered to get injured with rust ; not even in the summer time, when not in use. The door should then be taken off the hooks and properly cleaned, and rubbed with oil to prevent rust.

“The shovel used for the fire places should have a short handle, which is as convenient for use as a long one, and with a short handled shovel the fuel cannot be so easily thrown over the fire. The person who attends the fires should be directed to use his hands in opening and shutting the doors by their proper handles, and not suffered to do so with a spade or shovel, for however strong they may be made, they must soon be destroyed by improper usage.

“It is of the greatest importance to preserve the doors and ash pits

perfect; for if they be injured, it is difficult to repair them without taking them out of the brick work, which is attended with considerable expense, and cannot be done when the fires are in constant use."

#### GLAZING.

GLAZING is a very important matter in hot house building. The glass should be cut so as to fit the rabbet exactly, but not too tight; it should be cut upon the curvilinear principle, and well bedded, not only in the rabbet, but also in the overlaps, which latter should not be broader than one eighth of an inch, and laid in coloured putty, that of a black colour has the best effect. It is the utmost extravagance to talk of plate glass only being used for greenhouses. Some theorists also assert, that puttying the laps darkens the house and excludes the sun's rays. No doubt this is to some extent true; but were they left open when first finished, many weeks would not elapse before that they would become filled with dust and filth, which would exclude the same proportion of light, and instead of excluding the water, would rather tend to attract it into the house. The great advantage of puttying the laps is to prevent the breakage of glass, by leaving room for expansion in time of frost, and also by the glass having three solid bases to rest upon instead of two.

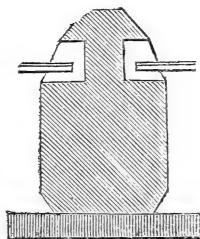
If economy be an object of consideration, the glass used may be cut under the size subject to duty, which will make a considerable difference in the expense, and will in all ordinary cases answer every useful purpose. In using the smaller sized glass, the laps may be left unputtyed, but their breadth should not exceed the eighth of an inch, which will carry off the water better than a lap of an inch and a half in breadth.

Green glass was formerly used in this country for hot house roofs, and such is generally used to this day on the Continent, but it is of all sorts the worst; for if, as Bouguer has shewn, one fortieth part of the light which falls perpendicularly on the purest crystal is reflected off, or does not pass through it, it may safely be asserted that green glass reflects off more than three fourths. Economy, as to the quality of glass, therefore, is defeating the intention of building hot houses, which is to imitate a natural climate in all the qualities of light, heat, air, water, and earth, as perfectly as possible. The best crown glass only should be used, and, as we have already stated, it should be cut upon the curvilinear principle, and bedded and fastened in with soft putty, formed of well wrought paste of flower, mixed with whitening and raw linseed oil, which is most durable, but requires a much longer time to dry. The hard sorts

of putty are objectionable, inasmuch as they are apt to crack unless they be painted soon after they are used; they are also difficult to remove when it becomes necessary to repair broken glass.

The most approved modes of glazing are curvilinear, lap glazing, reversed curvilinear, rhomboidal, perforated shield, entire shield, fragment, leaden lap, and common sash glazing. The first and last are certainly the best for our purposes.

An ingenious, and, we think, a very useful mode of glazing was published some years ago in the Transactions of the Horticultural Society, and is the invention of Mr. John Read, of the Regent's Circus, Piccadilly, well known to horticulturalists for his excellent patent syringes. "Mr. Read observes, that in the usual way, the surface of the putty being entirely exposed, soon loses its tenacity, and partially separates from the bar, thereby admitting wet into the house and hastening the decay of the wood. To obviate these defects, Mr. Read's sash bar has a groove on each side to receive the glass and putty and the top is planed off, leaving it slanting both ways, as is shown in the annexed sketch, which is a section of the bar and glass. There is not more difficulty in repairing the glass in lights, or roofs with bars of this form, than in those made in the usual way, as a narrow chisel, like a mortice chisel, cuts out the old putty with great ease."



#### FORM OF GREENHOUSES.

GREENHOUSES may be of various forms and shapes, but the further that the parts deviate from straight lines, the more will the expense be increased, on account of the waste of material and extra labour in workmanship. Circular, domed, and curvilinear houses are all liable to the above objection, and, in addition, are not easily ventilated. The ordinary form of straight roofs, or that of a span roof, is, in our opinion, the most economical and fittest for all purposes. It may not be unimportant if we state briefly some opinions of much greater weight than our own on this subject, both for and against such forms of roofs.

The intelligent Thomas Andrew Knight, Esq., observes, that the plan recommended by the late Sir George M'Kenzie, Bart., for forcing houses, although exceedingly interesting, "contains some defects which

cannot be obviated without deviating from the spherical to the spheroidal form, which Sir George states to be objectionable, on account of the great nicety required in the workmanship. On making a few trials to ascertain the variety of forms which might be given for hot houses, by taking the different segments of a sphere, I soon became perfectly satisfied that forcing houses, of excellent form, for almost every purpose and of any convenient extent, might be constructed without deviating from the spherical form, and I am now," says he, "perfectly confident that such house will be erected and kept in repair at less expense, will possess the important advantage of admitting more light, and will be found much more durable than such as are constructed according to any of the forms that have been hitherto recommended. By employing a small segment of a large sphere, as low and as wide a forcing house as can be wanted for any purpose, may be readily obtained. Instead of the half, a hemisphere of thirty feet diameter, let the half of one of fifty be chosen, and from the base of this cut off thirty five degrees, and from the summit fifteen degrees, and the following proportions for a forcing house will be given. Its height, (including eighteen inches of upright, opaque front, opening as shutters), will be twelve feet; its width in the centre, fourteen feet, and its length very nearly forty feet; and there are few purposes for which a house, constructed according to some of the intermediate forms, between that above mentioned and the acuminate semi-dome, will not be found extremely well adapted."

Curvilinear-roofed hot houses of all shapes, we ought to observe, require very great care in regulating the effects of solar heat, particularly those that are constructed of metallic matter. From the experiments made in the gardens of the London Horticultural Society, and published in the "Transactions" of that Society, vol. VI. p. 379, we learn that "in the first year of its trial, the roof was permitted to be wholly exposed to the action of the sun, but it was found impracticable to regulate its temperature under such circumstances, although the house was ventilated, not only by means of apparatus in the front and back walls, but the two ends of the house were so contrived that they will open almost entirely when necessary, so that a current of air may be introduced both at the ends and sides. The temperature was indeed kept regular during the night by means of fire heat without difficulty, but in the day time it was found impossible to do so. When there were alternate changes from a clouded to a bright sky, the action of the sun's rays was so sudden, that the thermometer of the house was raised too high before the speediest supply of air could be given; and when there was a whole day of continued



sunshine, with a calm atmosphere, as often happened in the early part of the season, the house could not, with all the ventilators in operation, be kept within ten degrees of the temperature required. After this experiment, it was determined to counteract the irregularity of temperature by providing the roof with an awning of canvass, which might be drawn over the glass or removed, as should be advisable. This produced very beneficial results. The experiment, therefore, seems to prove, that although with attention it may be practicable to force some description of fruits, perhaps with almost as much success as in a wooden house, yet that others are not to be made to bear fruit, and that upon the whole, a house constructed with wood is much better adapted to the purpose of forcing, than one with a curvilinear iron roof."

Not only are curvilinear metallic hot houses more difficult to manage in regard to temperature, than wooden and straight roofed houses of the same size, but they are also, from the same causes, more difficult to maintain in a proper state of humidity. This has also been satisfactorily proved in the garden of the Horticultural Society, from experiments made by Daniell's hygrometer, the result of which is, "that in curvilinear houses during the summer, the degree of atmospheric moisture, which appears to be most suitable to tropical vegetation, may be settled at about eight hundred and sixty, the temperature being from eighty to eighty seven degrees of Fahrenheit, and the transmission of light such as has been already stated to take place through an iron roof. And it has been satisfactorily ascertained, that the nearer the temperature and humidity of a stove approximates to these degrees, the more favourable is the artificial climate found for bringing the powers of vegetation into vigorous action. It can also be stated, that unless such a degree of humidity is carefully maintained during the summer months in a hot house constructed of iron, such a house will be found more rapidly prejudicial to the health of plants than one constructed of wood, because its atmosphere, if left to itself, would become more dry, and the plants would exhibit all the symptoms of aridity."

Our own experience in metallic hot houses has long ago satisfied us that they are, in the above respects, as well as in others, inferior to houses constructed of wood; and we are only surprised after the opinions of competent judges have been so frequently laid before the public, that houses of curvilinear forms, and of metallic materials should not have been, long before now, entirely expelled from our gardens.

Much has been said of late years, and we believe to very little purpose, upon the angle which the roof of a hot house should present to the horizon,

and indeed we find that this subject had attracted the attention of the celebrated Boerhaave. Philip Miller applied it to plant stoves, and Williamson, Knight, the late Sir George M'Kenzie, and others, have also directed their attention to the subject. The "Horticultural Transactions," and the "Encyclopædia of Gardening," contain a variety of opinions upon this subject; but so far as we know, few hot houses have been erected with much attention to the nicety of these theories.

Most hot houses are built to about an angle of forty five degrees or thereby, and we hear of few complaints against such structures. Indeed, this angle appears to be the least that will effectually drain off the water, and appears to us to be exceedingly well calculated for general purposes.

The following has been laid down as data to determine the angles of the roofs of hot houses by Wilkinson, in the Horticultural Transactions, vol. II. p. 237: "The angle contained between the back wall of the forcing house and the inclined plane of the glass roof, always equals the sun's altitude when his rays fall perpendicularly on that plane, provided that the inclination of the plane to the horizon be at an angle not less than twenty eight degrees, two minutes, nor greater than seventy five degrees. Within the above limits, the sun's rays are perpendicular twice in the year, once in going to, and once in returning from, the tropics." Hence, then, having determined in what season we wish to have the most powerful effects from the sun, we may construct our houses according to the following rule: Make the angle contained between the back wall of the house and its roof, equal to the compliment of latitude of the place, less or more the sun's declination for that day on which we wish his rays to fall perpendicularly. From the vernal to the autumnal equinox, the declination is to be added, and the contrary. Thus, to apply those principles to the slope of roof recommended by Knight, for ripening grapes in July, we have, say at London,

Latitude of London	.	.	.	51° 29'
Sun's declination on the 21st of July	.	.	.	17° 31'
				<hr/>
				33° 58' or 34° nearly.
				<hr/>

As we want the genial warmth of the sun most in spring, therefore, for general purposes, that construction would perhaps be best which

gives us the greatest quantity of perpendicular rays then. If the inclination were forty five degrees, the sun's rays would be perpendicular about April the 6th, and September the 4th; and as the rays would vary very little from the perpendicular for several days before and after the 6th of April, and the 4th of September, the loss of rays arising from reflection would, as appears from the annexed table, be nearly a minimum. Even at the winter solstice, the loss by the obliquity of the angle of incidence would be only two in one thousand more than when the rays fall perpendicularly, as appears by Bouguer's Table of Rays, reflected from glass, of one thousand incidental rays. When the angle of incidence is

87° 30'	584 are reflected	60°	112 are reflected
85° 0'	543	50°	57
82° 30'	474	40°	34
80° 0'	412	30°	27
77° 30'	356	20°	25
75° 0'	299	10°	25
70° 0'	222	1°	25
65° 0'	157		

*Ency. of Gard.*

#### PAINTING.

Every plant structure should be painted at least three times before it is finished, so as to prevent the timber from imbibing moisture, which if once in, and the paint laid over it, it cannot escape, and as a consequence, decay, under the general denomination of dry rot, commences, and going on unobserved, soon reduces the fabric to a state of ruin. Upon the same principle, the best quality of timber, and that well seasoned, should only be used. More mischief arises from a want of attention being paid to these two points than from all other evils put together.

In regard to colour, much may be left to fancy, at least for the last coat. White is the most common, but is soon stained, and looks dirty; green is very popular, but is the most expensive in the first instance, and requires to be oftenest renewed, as it is less durable, and sooner fades and looks bad. A soft stone colour is at once the cheapest, the most durable, and harmonizes best with garden objects.

Hot houses should be painted at least once in three years; but

much caution is required to prevent the cure from being worse than the disease, for if the rafters and sashes be damp before the painting is commenced, the damp within them will be prevented from escaping, and decay will be the consequence.



## THE HEATHERY.

AGREEABLE to the arrangement we have already purposed for the division of greenhouse plants into groups, or separate departments, we will now proceed to treat of each department separately.

The Heatherly, besides the extensive and varied family of ERICA, may with propriety contain the following genera of the following natural orders.

## ERICEÆ.

BLÆRIA OF SYMPIEZA

## EPACRIDEÆ.

ANDERSONIA	EPACRIS	SPRENGELIA
ASTROLOMA	LISSANTHE	STYPHELIA
DRACOPHYLLUM	LYSINEMA	STENANTHERA

## COMPOSITEÆ.

All the greenhouse species separated from the original genera,

GNAPHALIUM AND HELICHRYSUM

viz.,

APPELEXIS	ATHRIXIA	PHÆNOCOMA
ASTELMA	LEUCOSTEMMA	SPIRALEPIS
	METALASIA	

## RUTACEÆ

ADENANDRA	BORONIA	DIOSMA
AGATHOSMA	CORRÆA	ERIOSTEMON
BARYOSMA	CROWEA	RUTA

## LEGUMINOSÆ.

AOTUS	EUTAXIA	OXYLOBIUM
BOSSLEA	GOMPHOLOBIUM	PULTENÆA
CYCLOPIA	GASTROLOBIUM	PODOLOBIUM
CHORIZEMA	HOVEA	PLATYLOBIUM
DILLWYNIA	LIPARIA	SCOTTIA
DAVIESIA	LODDIGESIA	TEMPLETONIA

Such a house would be perfection in itself, comprising from seven to eight hundred species and varieties of Flora's choicest gems, plants of

evergreen and elegant habits, and from their great variety presenting to the eye a succession of bloom throughout the whole year.

Of the interesting family of erica, one of our most popular botanical authors, says, "of what other genus can it be said that every species, without exception, is beautiful throughout the year, and at every period of its growth—in flower or out of flower—and of every size and age? Suppose an individual had the penance imposed on him of being forbidden to cultivate more than one genus of ornamental plants—is there a genus he could make choice of at all to be compared to erica? Perpetually green, perpetually in flower—of all colours, of all sizes, and of many shapes."

The cultivation of this splendid tribe was the prevailing fashion about thirty years ago, and they would, in all probability, still have continued more generally cultivated than they are at present, had it not been for the supposed difficulty in the management of them. Mr. Page, of Southampton, very justly observes, that "a prejudice having spread that the culture of these plants is difficult, one of the greatest ornaments of the greenhouse, has hence, of late, been neglected, although the method of culture is as easy and nearly as certain as that of the geranium, but requiring a little more delicacy in the execution." Nothing can be more erroneous than to assert that they are more difficult to manage than other exotics, and we hope, if the following brief directions be followed, that the truth of this assertion will be fully established.

In order that our observations may be clearly understood, we will divide them into the following heads:—

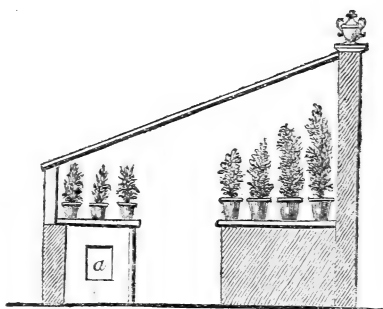
Structures calculated for their growth.	General treatment when out of doors.
Propagation & treatment when young.	Soil.
General treatment when in the house.	Shifting.

The general routine of culture here recommended for the genus erica, is, for the most part, applicable to the genera enumerated above; but as there are some particulars in which they differ, such will be noticed in its proper place. Having adopted the term Heatherly, however, and that genus constituting fully more than all the others together, added to the circumstance that they of themselves deserve an entire house, we will give them the precedence in the following remarks, and then take up the management of the remaining genera as a supplement to this article.

#### STRUCTURES FOR THE GROWTH OF ERICA.

THE Cape Ericas are chiefly found indigenous, at considerable altitudes above the sea, and hence, even in those latitudes, the thermometer often

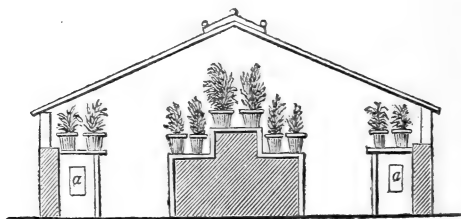
falls below the freezing point, and our experience in their culture enables us to say that they are capable of enduring a considerable degree of cold with impunity. Like all mountain plants, they will not long flourish in a damp, or impure atmosphere, nor in one, however dry, if excluded from a free circulation of air, and full exposure to solar light. It follows, therefore, that in the selection of a proper habitation for them, one fully exposed to the sun, and in a perfectly dry situation, and constructed so that the plants may stand near the glass, capable at the same time of ventilation to the fullest extent, with the front and roof sashes rendered moveable when required, will be the most proper habitation for them.



The annexed section will give some idea of what may be considered an economical and useful heath house, and may be of any length required, from twenty to one hundred feet; the height over the passage should not exceed seven feet, which will be ample space to walk under; the width twelve feet, allowing three and a half feet for the passage, four and a half for the left hand stand for the largest specimens to be placed on, and four feet for the front platform, on which the smaller plants are to be placed. These platforms might be formed of Welsh slate, perforated to admit of the superfluous water passing off, and also to allow a circulation of air to pass through amongst the plants. The front sashes should be eighteen inches high, and the front platform about level with the wall plate. The cavities under the plant tables should be left open, so that no tendency to generate damp may be encouraged; and under the front platform the flue (a) should be placed, its principal use being to dry up superabundant humidity, and to repel the frost when it is very severe;

for if the thermometer in the heathery do not fall below thirty degrees, the plants will not sustain any injury from want of artificial heat.

Upon this principle, although upon a much more splendid scale, is the Heathery at Woburn Abbey, one of the seats of his grace the Duke of Bedford, in which one of the best collections of ericas in England, has been cultivated for many years, with the most complete success. His Grace's splendid work upon this tribe, "*The Hortus Ericæus Woburnensis*," printed for private distribution, has materially assisted in maintaining a taste for this family, and is also a proof of the high estimation they are held in by that amiable and patriotic nobleman.



The annexed section of a span-roofed house is also upon an economical scale, and well calculated for the cultivation of erica and their near associates. As in the last example, the whole of the side and roof sashes should be moveable, the height over the passage seven feet, and the internal width eighteen, allowing three and a half feet for each passage, three feet for the breadth of each of the front platforms, and five feet for the centre one, on which the largest plants are intended to stand. The top part of the roof is covered with boarding of one foot from each side of the ridge. This boarding is intended to support an awning of thin canvass, mounted on rollers for the purpose of shading the roof during the heat of summer, and also for the support of a covering of thick canvass, also mounted on rollers, to exclude the cold during intense frost, and which latter covering will be sufficient protection for them and enable the cultivator to dispense with fire heat, which, under any circumstances, is very inimical to the plants of this order.

From November till March, the latter covering will be occasionally required, and the former, for shading, occasionally, from June till September, after which periods both may be removed. The foliage of



the heath tribe would sustain, without injury, the greatest degree of sun heat we ever have in these latitudes; but it is the roots that we wish to protect by partial shading, for when the sun acts fully on the pots, they become heated to a great degree, and as the roots of all healthy heaths and similar plants are in close contact with the pots, they are rapidly dried up, or heated beyond the degree that they are capable of bearing; for as in their natural habitations they grow amongst thick herbage, and are partially shaded about their roots, they consequently are kept much cooler than if they were growing without any covering whatever. There are, however, some exceptions to this rule; but by far the greater number are so circumstanced.

Along the centre of this span house, a row of cast iron columns should be placed, to support the ridge, and which may be either plain or ornamented with appropriate mouldings. A flue *a a*, may be run along under the side platforms, for the purpose of drying up superfluous humidity or damp, it will rarely be required for any other purpose if the covering recommended be adopted. However, as the expense in the first erection is not great, it will be well to have one, even for precaution.

No doubt heaths are, and have been successfully cultivated in houses of the most ordinary description, but the success attending their growth has depended principally upon free ventilation, moderation in watering, an almost total absence of fire heat, a full exposure to the sun, and closeness to the glass. So far as cultivation is concerned, heaths may be very well grown in pits, which is the most economical of all plant structures, but in pits, the owner loses much of their beauty, from the circumstance of their being placed in a very unfavourable position to be seen when in flower; and as they will not bear with impunity for any length of time, the close confinement of the drawing room, much of the interest arising from them is lost, if not placed in a house adapted for them.

#### PROPAGATION AND TREATMENT WHEN YOUNG.

Plants of the natural order *Ericææ*, like most similar shrubs, are readily increased by seeds and cuttings, and rarely by any other means. Seeds are often imported from the Cape of Good Hope, and are also frequently ripened in this country; from both of these, hybrid varieties are very likely to be obtained, for we believe that many heaths cultivated in this country, and considered as species, are no other than hybrids originated from seeds procured by one or other of those means. When we consider the operations that are constantly going on in nature, in regard to this

subject, both in a wild and in a cultivated state, we are only astonished that more numerous varieties have not been recognised.

The best time for sowing seeds of this order is early in spring, say February and March; and for this important reason, plants originated from seeds sown in spring, will attain such a size and strength before autumn, as to enable them to outlive the winter following, which is a trying time for young plants. In preparing pots for this purpose, they should not be too large; the size known by the term thirty-two's is the best. We need hardly remind the most inexperienced in cultivation, that they should be well drained, by being filled at least two thirds with broken pots, small stones, or cinders. The soil used should be of the sort called very sandy peat. The seeds should be sown on the surface, (which must be made smooth and level), and scarcely covered at all. When sown, watering should be regularly attended to, and applied with the finest rose pot. They should be placed in a cool, shaded frame, under glass, or plunged in a rather damp border, where the sun seldom shines, and covered with a hand glass. In such a situation, water should be seldom applied, because the seeds being so minute, they are liable to be washed off in the process, and therefore, the less frequently they are watered the better. As the young plants appear, air should be progressively admitted to them, and every precaution now taken to guard against damp, an excess of which, as well as an excess of drouth, would be equally fatal to them in this state. When the plants have attained the height of one inch or so, they may be transplanted into small thumb pots, placing three, four, or five in each, and as near to the edge of the pot as possible. From some cause, not easily explained, we find that young plants and cuttings root faster when placed in close contact with the sides of the pots in which they are planted, than when they are placed more towards the centre. After this first potting, they should be kept for eight or ten days in a close, cool frame, or pit, shading them from the sun in the middle of the day, and gradually exposing them to the air, until they are found to be so established as to stand the full heat of the sun. The greatest attention must be paid to a regular system of watering, for if they be allowed to become too dry, they will die off in a few hours' time, and if kept too wet, they will damp off in an equally short period.

## PROPAGATION BY CUTTINGS.

Almost all the plants of this natural order will strike root by cuttings ; some sorts, however, requiring a longer period to do so than others. The most eligible wood for this purpose is the young wood of the present year's growth, when it becomes partially hardened, so as not to be liable to damp off. It would be impossible to convey an idea to the uninitiated, of the proper state that the wood should be in for this purpose, but the cultivator who knows any thing of the matter, will readily understand us when we say, the wood should be fully matured, but before it had attained its dark colour, and to be, when slightly pressed between the finger and thumb, somewhat firm, but neither yielding to the touch nor yet quite hard. In regard to the length of the cuttings, much depends on the habit of the different species. Some of the robust growing sorts may be from an inch to an inch and a half in length, while others of the more shy growing kinds can only be obtained about half that length. The cuttings selected, should be chosen from the healthiest plants, and taken off close to where they issue from the old wood. In preparing the cuttings, the leaves should be cut clean from the shoot, either with a sharp knife or fine pair of scissors, the end should be cut transversely across in a neat manner, so as not to leave the wound ragged or bruised. The leaves should, upon no account, be shortened, neither should any more of them be taken off than just so far as the cutting is to be inserted into the sand.

With respect to the proper season for putting in cuttings of this order of plants, and indeed of most other slow growing kinds, the spring is the best, for the same reason given above for sowing seeds.

It sometimes happens, however, that cuttings cannot be obtained in a proper state at that season : when such is the case, recourse must be had to inducing the old plants to make wood fit for the purpose. This is to be effected by placing them into a little heat early in spring, they will then make plenty of young wood, which is the best for cuttings. In extensive genera, like that of *erica*, it would be impossible to state any particular period of the year for commencing the operation of propagation by cuttings, because some one or other of them are in a fit state for the purpose on almost every day in the year ; therefore, the time for putting in cuttings should be regulated rather by the state of the plant than by the time of the year.

The method of preparing the pots is not essentially different from that recommended above for seeds, draining being the chief object to be kept in view.

The following very judicious mode of proceeding is recommended by Mr. Mc'Nab, of the Edinburgh Botanical Garden, than whom none has succeeded better in the cultivation of this tribe. "In extensive nursery collections, where great quantities of plants are wanted, one pot may be filled with cuttings of the same species, when such can be got in sufficient quantities; but in private collections this is not necessary, for a few plants of a sort, in general, are all that is required. When this is the case, the kinds selected to be put in the same pot, should be as nearly of the same habit as can be judged of at the time. For example, I shall suppose four pots are intended to be filled with cuttings. Such as the following should be selected for each pot:—

FIRST POT.	SECOND POT.	THIRD POT.	FOURTH POT.
Melastoma	Pinea	Ventricosa	Aitoniana
Petiveriana	Pinifolia	Pregnans	Jasminiflora
Petiveria	Vistita	Linnæana	Ampullacea
Sabana	Grandiflora	Linnæoides	Irbyana
Penicillata	Purpurea	Colorans	Inflata.

"Unless this is attended to, one sort will be found to strike root in a much shorter time than others in the same pot, which makes it more inconvenient when potting them out. This, however, must always happen to a certain extent, for a little difference in the age or firmness of the cutting, even when the work is performed by the most experienced hand, will often make a difference in the time required to strike root. When the pot is thus filled with the cuttings, it should be well watered with a fine rose water pot, and placed in a close, shady part of the stove, admitting as little air as possible near to where the cutting pots are placed, and taking care to water them freely every day. Indeed, when put in this way, there is no risk of over watering them; for, having them well drained, the water is allowed to pass freely through, and so far from injuring the cuttings, they are benefitted by it."

We must observe, that however excellent the above mode of striking heaths may be, it cannot, under all circumstances, be applied in practice, because there are many cultivators who have not the convenience of a stove to place them in. A substitute for the stove may be found in a well regulated cucumber or melon bed, in which many strike heaths and other hard wooded plants very successfully. The reason for applying heat to the cuttings is to excite them to the greatest possible degree, during which they will, if they are in a fit state, strike root very soon, or damp off at once.

The more usual method of striking cuttings of the generality of heaths

is to plunge the pots into coal ashes, rotten tan, or similar matter, in a rather damp, shaded border, covering each pot with a bell glass, and the whole with a close frame and lights. By this method the cuttings are longer in rooting, but as it is within the reach of every one possessed of a garden, however small, and as it is attended with less risk from inattention, &c., we recommend it to their attention. It is necessary in preparing the pots for the cuttings to select them of about equal sizes, say that of thirty-twos, and to fill them to within an inch and a half of the top with broken pots, cinders, coarse gravel, or small stones, over which a thin layer of moss, (*hypnum*,) should be placed to prevent the finer particles of mould from being washed down amongst the drainage. The pot should then be filled to the brim with fine, pure white sand, as free as possible of earthy or irony matter, but as this is seldom to be procured sufficiently free of those matters; it may be well to wash it by putting small quantities at a time into a bag, and dragging it frequently through a cistern, or stream of water. When put into the pot it should be well watered and pressed firmly down, the surface made smooth and level, and the cuttings put in as soon after as possible.

In the propagation of heaths it has been almost universally maintained that bell glasses should be used under all circumstances, that is, whether they be placed in heat, in a shady border, cool frame, or pit. Experience has taught us that cuttings placed in heat succeed, for the most part, better without glasses than with them: some of the most difficult rooting sorts, such as the *E. glauca*, *E. elegans*, may be covered with advantage; but these are few in number, and do not, if well managed, require to be so often renewed as most others. When glasses are used, the greatest care must be taken that they be kept regularly wiped at least once a day to prevent damp from destroying the cuttings. Cuttings placed in a cool, shaded border, frame, or pit, should certainly be covered with bell or hand glasses, and these should remain on until they are rooted, and taken off only for the purpose of being wiped, and any damp or mouldiness removed from the surface of the sand in which they are placed. Regularity in watering, and also in shading, is absolutely necessary to insure success. When the young cuttings have begun to grow, air must be gradually admitted to them, so that by the time they are rooted and fit for transplanting they may be able to withstand the sun's heat, and free exposure to the air. In regard to their first potting, the directions already given for seedlings is applicable also to cuttings, as it also is to their subsequent culture.

## GENERAL TREATMENT IN THE HOUSE.

It has long been our opinion, although we are aware that it is not in exact accordance with general practice, that the *Epacris*, *Helichrysum*, and some other similar plants of the genera enumerated at the commencement of this article, should not be taken out of the greenhouse during summer, as the majority of plants are. This opinion is strengthened, by the success we have experienced, in a collection of about three hundred species of the best sorts, so managed under our own immediate charge, and much more so by observing the practice of those French and German cultivators who follow a similar plan, as well as that of the superior management of these plants in the Edinburgh botanical garden, where specimens are to be seen grown in tubs, from three to four feet in diameter, and the plants from eight to twelve feet in height. No cultivator has been so successful in this department as Mr. Mc'Nab, the intelligent curator of that garden, from whose valuable treatise on the subject we take the following quotation. "When I mention the treatment of heaths when in the house," he says, "I must let it be understood that if I had sufficient accommodation under glass, I never would take heaths out of doors, unless it were for the purpose of shifting, or taking them from one house to another. My practice would be to keep them in the house all summer, giving them plenty of air, and to keep them cool during winter. I know it is the common practice to turn heaths out of doors for four or five months in summer and autumn, and it is also a pretty general opinion that by doing so it makes them hardier, and enables them to stand the winter better than they would do if kept within doors during summer. From this opinion I must take the liberty of differing, as I know of no species of heath that will not bear as much cold in winter, without suffering from it if kept in the house during summer, as they do when turned out of doors, and many of them, (perhaps all), I know, will bear more cold in the winter. For, by the latter practice, the young wood gets better ripened, and better able to resist cold in winter." The same excellent authority, in speaking of plants in general, recommends, where there is sufficient accommodation, to keep all plants under glass during summer, and, in such cases, to allow them plenty of room, "for unless they are placed quite separate," he observes, "from each other, so that a free circulation can pass among them, they will suffer much more when crowded in the house in the summer than they will do in the same situation during the winter, for in winter they are in a more dormant state, and not growing with the same vigour. I would however advise every

# GREENHOUSE PERENNIALS



*Antirrhinum majus* (Snapdragon)

*Antirrhinum* (Snapdragon) - *Antirrhinum* (Snapdragon)

*Antirrhinum* (Snapdragon) - *Antirrhinum* (Snapdragon)





one to keep as many of their best specimens and best kinds within doors during summer as they can, without having them crowded together. I cannot give better directions than to say, that one should not touch the other when in the house in summer, and if the nearest part of one to the other is two or three inches apart, so much the better. The house, however, should be ventilated at all times, and, except in cases of high wind or heavy rain, both top and front lights should be kept open night and day; and besides watering the earth in the pots freely when they require it, they should be well watered over-head with the garden engine every day; and if the weather is hot and dry, this operation should be performed twice every day, namely, both morning and evening."

There is one branch of culture in which we differ from the talented writer above quoted; he recommends a partial degree of shade during the hottest days of summer. In this particular the Messrs. Loddiges agree with us, as do most of the continental cultivators. This, however, may be less important in the latitude of Edinburgh than in that of London, and is certainly much less so there than in most parts of France, or the south of Germany, and for that reason it may not be noticed in the excellent directions laid down by Mr. M'Nab. Messrs. Loddiges follow the continental fashion of shading by means of long slender branches of birch or other deciduous trees, which are laid over the roof of the house, breaking the full force of the sun's rays, while at the same time air is not much obstructed. Our practice is to shade by spreading netting over the roof, and latterly by having a fine thin canvass awning, mounted on rollers, on the top of the house, which is let down or taken up at pleasure.

Air cannot be too freely admitted to heaths, and, indeed, to all similar plants, and to effect this the upright lights may be left open altogether, until the thermometer, in the open air, falls to two or three degrees below the freezing point; indeed, we have even had the mould in the pots frozen pretty hard without the application of fire heat. If the house be pretty air-tight and dry, fire heat will seldom be required; for we find by Mr. M'Nab, (*Treatise*, p. 31.), that he has had no accident in this respect when the thermometer out of doors indicated sixteen degrees of frost. The following quotation on this subject of temperature is so excellent that we are induced to give it at length.

"I have had all the heaths in the house frozen for days together, so hard that the pots could not be removed from their places without breaking them, and fresh air constantly admitted at the time, and I have never seen one of them suffer in the smallest degree from it; but, on the contrary, found them thrive better than under any other treatment.

“I have several times had the heath house in winter without fire heat, when the thermometer out of doors stood at sixteen degrees below freezing. But in these cases the house was always shut close, and I have never seen the heaths suffer from this cold. I would not, however, advise any person to risk his heaths in such a temperature until he had himself tried some experiments on the degree of cold which they will bear, and from that he will learn more than he could from volumes written on the subject; a very little observation will soon convince him that his heaths require but little fire heat during winter. I have already said that heaths suffer from too much artificial heat; and all that I have read on their cultivation seems to concur in this particular: but I am not aware that any one has pointed out what degree of heat or cold is injurious; and, indeed, I have only been able to ascertain this myself, to a very limited extent. The time, however, when these plants suffer most from heat is, when a sharp frost sets in, and no heat is applied till after the frost has taken effect in the inside of the house. Then a fire is put on, and the frost is driven out. It is better, no doubt, in such a case, to keep out the thief if you can, but if once let in, keep him in, and never attempt to force him out. We know that heaths in the open air will not suffer when the thermometer stands four or five degrees below freezing; and we know also, that heaths in the house in winter will bear the same degree of cold with impunity. Now, we shall suppose the thermometer out of doors to fall to twelve or fourteen degrees below freezing, and no heat in the heath house; the thermometer in the inside may then be four or five degrees below freezing. If there be no appearance of a change, then it is necessary to apply heat to the house; but all that is wanted in this case, is just enough to prevent the temperature from getting lower than it was when the heat was introduced. Suppose the thermometer to sink to eighteen or twenty degrees below freezing during the night; the instrument inside should range as near as possible to what it was when the heat was applied. This however requires very particular attention. From what I know, heaths will suffer, if, after the thermometer has fallen four or five degrees below freezing inside of the house, heat be added so as to raise the temperature, and drive out the frost, during the time the thermometer is still sinking out of doors. It would be much better if the house were left without fire heat, even with the thermometer fifteen or sixteen degrees below freezing point out of doors; such treatment is bad for all plants, but more particularly for heaths. If we were certain that the thermometer during the night would not sink more than ten or

twelve degrees below freezing out of doors, no artificial heat whatever would be necessary in the heath house."

We have made this long quotation, because it is the tried practice of one of the best cultivators of the present day; and, if acted upon, will remove much of the cultivator's anxiety, so far as the true principle of applying artificial heat is concerned, and convince him how small a degree of that element is really necessary, in greenhouses of the ordinary descriptions.

During winter, water should be very sparingly applied to heaths; and in times of severe frost only enough should be given to keep the plants from drooping. The case is different however, during spring and summer, when they should have it abundantly supplied once, and, in some cases, twice a-day, at their roots, and two or three times during the week over their leaves and branches by using the syringe or small garden engine.

In regard to the general treatment of Cape heaths, we find the following excellent, plain, and useful directions laid down by Mr. Fyffe, in a communication in the fifth volume of the "Horticultural Cabinet," in answer to a correspondent who complains of his heaths getting naked, or, more properly speaking, rusty. "This, I should say," observes Mr. Fyffe, "is from the effects of drought; from being crowded close together; or from the pots being exposed to the powerful rays of the sun. If the pots are placed in the open air, as is the practice with most of our hardy greenhouse plants, this always takes place with the more tender sorts of the *Ericæ*. The sun acts so powerfully on the pots, when exposed for any period of time, as to dry the ball completely; and, allowing the plant to be watered with the greatest care, the substance of peat soil being of a peculiarly drying nature, the water often runs off, if the plants are potted high, without penetrating to the centre of the ball;—this is the cause of heaths going off so suddenly. When once allowed to get completely dried up, you may water them and go away, fancying that all is right, when, perhaps, if you were to turn out the plant, the water has not penetrated one inch. The next day comes a hot and burning sun, your plants stand exposed as usual, and, by the action of the sun, the pot has succeeded in completely drying up the ball by mid-day;—the plant stands so until night, and for six hours it is actually dying for moisture."

To remedy this evil, the following rule should, according to the above authority, be observed:—"If in the habit of placing heaths in the open air, never do so without plunging the pots to the brims in cinders, ashes, or sand, the former being the best, not being liable to be infested with

worms, keeping the ashes in a moist state by watering, as also giving each plant a regular supply every night, according to its state of dryness. Heath is much benefitted by being partially shaded by canvass or any light substance when set in the open air, as the sun acts so powerfully on the foliage when first taken out of the house; but if a house is especially set apart for the cultivation of heaths, I would not," says Mr. Fyffe, "take them out at all, except a few, so that the rest may not be over-crowded, giving air at all times, except in very severe weather, or when cutting winds occur, if the stage of the house stands high or much exposed to drying winds. When air is admitted to the house," Mr. F. recommends "the pots to be protected by placing a quantity of hypnum amongst them, keeping it moist by watering."

Cape heaths are very liable to be attacked by mildew, particularly in the neighbourhood of London: and some collections have been nearly destroyed from this cause.\* Sulphur, applied either in a dry or moist state, is the most effectual cure, and should be applied upon the very first appearance of the disease, by dusting the plants all over with the dry flour of sulphur, or by making up a thick lather of sulphur, mixed with soap, and laid on the plants with a painter's brush. It is difficult to trace the real cause of this disease; some attribute it to the practice of exposing them during summer to the power of the mid-day sun; others, to the excess of water given towards autumn; while many think it is an atmospheric disease, and that some situations are more liable to its effects than others. It is said to be of rare occurrence in Scotland, owing, probably, to the summers being cooler there than in England. Whatever may be the cause, the effect is in general fatal, for heaths once attacked by the disease seldom recover.

An anonymous contributor to the *Gardener's Magazine*, Vol. IX. p. 245, observes that "the best preventive is placing the plants, during summer, behind a wall, hedge, or other shelter; so that they may be shaded from the rays of the sun five or six hours in the hottest part of the day, without having recourse to awnings of any kind; likewise, to house them early in autumn, in houses where the sashes can be drawn off in fine weather, and put on to protect them from heavy rains. For the more delicate species, generally kept in pits and frames in summer, the best preventive is to use lights glazed with green glass, keeping the lights on from nine o'clock in the morning till six o'clock in the evening, and giving plenty of air, by

\* Willdenow says it is occasioned by the growth of a fungus, the *Mucor Erysiphe Linnæi*, or by a whitish slime deposited on the plant by some species of aphides.—*Keith's Botanical Lexicon*.

tilting the lights up at the back of the pits and frames, but never to use shading of any description. The lights to be drawn entirely off during the night, except in rainy weather. With this mode of treatment, slight waterings over head occasionally are beneficial."

Heaths are not very subject to the attacks of insects; the green fly, however, sometimes assails them, but these are readily got rid of by slight fumigations of tobacco.

#### GENERAL TREATMENT OUT OF DOORS.

A want of sufficient accommodation induces many to place a part if not all their heaths, as well as other greenhouse plants, out of doors; and habit, we believe, induces many more. The hardier and more free-growing kinds may not suffer much from this practice, but the finer and more delicate sorts evidently do. We believe the rationale of turning exotic plants into the open air, is to adopt the least of two evils; for if they be kept under glass during the growing season, and closely crowded together, they suffer as much for want of fresh air as they would do if placed in a sheltered situation in the open garden. It will be the most prudent method to adopt, to take out only such as are hardy and robust, leaving the more rare and tender sorts under cover; in which they will then have plenty of room.

The season for taking heaths out of the house commences about the end of April, when some of the hardiest kinds may be set out; the next hardier section in May, and the next in June, retaining by all means the most tender of all in the house. A dry, sheltered, but not shaded situation should, if possible, be chosen for them,—dry, to protect them from a damp and impure atmosphere,—sheltered, to prevent them from being broken or upset by the wind, and shaded only to the extent necessary to secure them from the full force of the sun's rays during the heat of the day. A somewhat elevated platform, covered with coal ashes, should be formed for them, upon which they should stand, without being plunged. If the spaces between the pots were filled with sphagnum, hypnum, or other mosses, the whole might be made ornamental and extremely useful; first, by hiding the pots, and, secondly, by preventing the heat of the sun, which is very injurious, from acting upon the roots, which are extremely fine, delicate, and always placed round the extremity of the balls, and in close contact with the pot. To avoid this, to save labour in watering, and to prevent them from being blown down, some recommend plunging them in the ground, or in the coal ash floor prepared for them; but this latter practice is, we think, objectionable, as the roots are very

liable to perish from cold and excess of humidity. Lines of cord should be stretched along the plant ground, and fastened to neat poles or stakes; to these cords the plants should be individually fixed, to prevent their being blown down.

From the end of September till the beginning of November is the proper season for removing plants again into the house, and a somewhat similar system should be acted upon as recommended for taking them out; only, those last taken out should be first taken into the house, and the next in rotation. During summer, water should be copiously supplied, not only at their roots, but occasionally over their leaves and branches, by using the syringe or garden engine. But this must only be understood to apply to very hot and dry weather. Heaths, and all plants grown in peat earth, should never be allowed to become very dry at the root; for, from the nature of the soil, it is difficult to supply a sufficient degree of moisture to them after they have become very dry.

#### SOIL.

There is no subject in gardening more difficult to give written directions upon, than that of soils, so little, unfortunately, have they been chemically studied, and so vague and unintelligible are the tests by which they are practically known. The soil which the *Ericæ* and many other fine-rooted plants prefer, is called peat, bog mould, heath mould, moor earth, &c., and abounds in sufficient quantities in many places, particularly in uncultivated heaths. But of this soil there are both good and bad sorts, that is, sorts in which plants will grow to perfection, and others in which they languish and decay. Nor is it to be taken for granted that that peat which produces the finest and healthiest crops of our common heaths, such as *Erica Tetralix*, and *cinerea*, is always a fitting soil to be used for exotic plants of similar habits; for many, by contenting themselves with this test, have found out their error, when too late to remedy it. That peat is best which contains about one fourth or one fifth of coarse white sand, and is taken from a dry heathy common, which is never overflowed with water, and off a sub-soil in which the recently discovered chemical substance, *creasote*, which has deleterious effects upon all vegetables, does not abound. It might be well for the cultivator to have a chemical analysis made of his soil, by which the presence or absence of creasote would be determined, and which any respectable chemist would discover for him. When abundance of sand does not naturally abound in the peat, any coarse white sand, free of iron matter, may be added. It appears to be of little consequence whether or not good peat

be prepared for any previous period in the compost yard prior to using ; we rather think that the sooner it is used the better. As a substitute for peat, some have recommended very rotten dung, decayed leaves, &c., having a due proportion of gritty sand added ; and others have suggested the addition of very rotten manure to be used with peat, with a view to increase the rapidity of the growth of the plants. The former may be used, in default of better, for hardy American plants, but the addition of the latter is by no means to be recommended.

A very interesting paper appeared in the first volume of the Gardener's Magazine, on the culture of Cape heaths, by Mr. J. Bowie, a botanical collector employed by the directors of the Kew garden, and who, having had ample opportunities of studying the natural habits of the genus, arrived at the following conclusions ; viz., that the soil in which the seeds of heaths should be sown, ought to be rather sandy than boggy ; the soil for the first potting off of seedlings should be three fourths sandy peat and one quarter sandy loam. For the first shifting of young plants, one half sandy peat and one half sandy loam ; for the second shifting, one fourth sandy peat and three fourths sandy loam ; and for the third and future shiftings, sandy loam only. To show the propriety of such treatment, Mr. Bowie has selected the following list of sorts, stating the nature of the soils and situations in which they are found in their natural state.

Linnæoides Tubiflora Colorans	} In running waters and springy grounds, a black vegetable soil.
Albens Ampullacea Retorta Ardens Fastigiata Fascicularis	} Shattered sandstone rocks, little or no soil, the roots embracing the stones in the crevices.
Caffra Eriocephala Gelida Halicacaba	} Similar situations to the last section, but they thrive more freely in the moist cliffs, 3000 feet above the sea.
Viscaria Blærioides Viridiflora	} Decomposed sandstone, shaded by Scirpoidæ, &c.
Sebana Sextaria Plukenetii Baccans	} Decomposed schistus, lower parts of the mountains and secondary hills, exposed to drought.
Massoni Calycina Retorta Walkeri Gracilis	} In pure sand, exposed to heat and drought on the mountains, from 2000 to 5000 feet above the sea's level.

Mammosa Metuliflora Cerinthoides Ignescens Grandiflora	}	In sand on the lower plains, frequently on spots abounding with natron.
Vestita Filamentosa Cerinthoides Cruenta Versicolor Triflora	}	In loam, with iron pyrites, on the exposed plains and secondary mountains, enduring drought at times for several months.
Urceolaris Persoluta Arborescens	}	Decomposed schistus, on the stream in deep shaded glens.
Vestita Versicolor Discolor Hirta	}	In stiff loam and margins of woodlands, moist glens, &c., surrounded by various Pelargoniums, Scirpoidæ, &c.

The soils in which the plants of the first and fourth of the above sections are found, approach nearly, Mr. Bowie observes, to some of our soils, but not precisely; he adds, that with the exception of those in the above two sections, no bog earth is wanting: it only, in his opinion, serves to weaken their growth, whereas a good sandy loam would strengthen them, and insure good flowering plants for years.

#### WATER.

Soft water alone should be used for watering plants of every denomination: that from a pond or large river, or such as is collected in cisterns from the roofs of buildings, to be preferred. Water pumped from wells, and such as may be procured from springs, should be exposed for as long a period as possible to the action of the sun and air before it can be usefully applied to plants. Water impregnated with mineral matter, such as iron, salt, &c., should be carefully avoided; and that containing much calcareous matter is injurious to many plants, and to none more so than the genus *Erica*.

#### SHIFTING, OR POTTING.

Early in spring appears, from practical observation, to be the most proper time for shifting or potting plants of this order that they may make roots during summer: but to this rule there are some exceptions, namely, the state of health of such individuals as require shifting into other pots at various periods of the year. All plants whose roots have completely filled the pots, and whose balls are hard in consequence,



should be shifted into pots of one size larger. All plants that appear in a weak and sickly condition, should be turned out of the pots and the roots examined, the dead ones cut away, the sour and exhausted mould displaced, and then planted into a pot somewhat smaller than that out of which it was taken. When a pot feels heavier than usual, it is a sign that the ball has absorbed too much water, either from an excess of that element having been supplied, or, as is more generally the case, from imperfect draining. When such is the case, reduce the ball, prune the roots, and re-pot it as recommended above. The mould should be prepared by being chopped fine, or even put through a coarse sieve, of not less than one inch in the mesh, unless, indeed, the plants be young; for very large plants the mould may even be much coarser than that which will pass through a sieve of the above dimensions. Whether for large or small plants, it is absolutely necessary that the mould be dry at the time of potting, as should also be the pots into which the plants are to be put. It is not always necessary that new pots should be used, but care should be taken that they are clean, and selected of sizes to suit the plants to be operated on.

In potting, draining is of the first importance; for this purpose from one to three inches, according to the size of the pot, should be filled with broken pots, cinders, small stones, chippings of freestone, or small pebbles, over a piece of potsherd or oyster shell, placed over the hole in the bottom of the pot: over this drainage a thin layer of dry moss should be placed, to prevent the finer earthy particles from being washed down, and to stop the cavities through which the superfluous water is intended to pass; and as the various species of moss, *hypna*, &c., have the property of absorbing humidity, and also of retaining it for a considerable time, the roots will by this means be kept cool and moist, much to their advantage.

In placing the plant in a new pot, it has been recommended to keep the top of the ball considerably above the level of the top of the pot: in so far as the plant is concerned, this is admitted to have rather an unsightly appearance. The rationale of this mode of potting appears to be, that it prevents the plant suffering from excess of water, as the ball at the stem of the plant is so much above the level of the part next to the pot, that the water, instead of finding its way into the centre of the ball, passes down between it and the pot, where are all the roots that are capable of absorbing it for the use of the plant; the superabundant water passing off through the drainage.

The balls of heaths, if in good health, do not require to be broken, as is necessary with some other plants; it is in general sufficient if the sides

of the balls be gently patted with the hand to loosen the outside fibres, which, in healthy plants, will be found in abundance round the outside of the ball, nor should any plant be shifted until such is the case.

It appears to us that the free or luxuriant growing sorts thrive best in rather large pots, and in a peat soil not over sandy, while the slow growing and slender sorts require much smaller pots, and a soil in which more sand abounds, either naturally or by addition ; it is also necessary that the pots into which the latter are to be placed should be completely drained. The latter also requires at all times much less water, because they are, for the most part, found indigenous in soils and on situations where little soil and less moisture abounds.

#### BLÆRIA AND SYMPIEZA.

Two genera which very much resemble heaths ; natives of the Cape of Good Hope, and requiring exactly the same treatment as *Erica*.

#### EPACRIS.

This beautiful genus thrives best in very sandy turf mould, of a peaty nature. Cuttings strike best when taken off during winter or early in spring ; they seldom succeed when struck during summer. They should be planted in sand, and placed under bell glasses ; their treatment otherwise, is not different from that recommended above for *Erica*.

#### SPRENGELIA, ANDERSONIA, AND LYSINEMA,

Have much of the *Epacris* in habit. They are propagated by cuttings of the young wood, and also from imported seeds, exactly in the same manner as *Epacris* and *Erica*, requiring the same soil and general treatment.

#### DRACOPHYLLUM.

This is a singular genus of plants, very difficult to increase otherwise than by seeds, and these are seldom imported, at least if they are they seldom grow, for *D. secundum* is in particular a very rare plant. Cuttings of the half-ripened shoots have been rooted in sand under a glass in a moderate heat.

#### ASTROLOMA AND STYPHELIA.

These are increased by cuttings, and require the same soil and after-treatment with *Andersonia*.

GNAPHALIUM, METALASIA, ASTELMA, ELICHRYSUM, HELICHRYSUM,  
PHÆNOCOMA, AND APHELEXIS.

These are greenhouse plants of very great beauty, and formerly stood under the names of *Gnaphalium* and *Elichrysum*. All of them are readily increased by seeds, which often ripen in this country, and are sometimes imported from the Cape of Good Hope, from whence most of them come. The seeds should be sown as soon as ripe, or as soon as received, in light sandy peat soil, placed in a dry airy situation, in a pit or greenhouse. When they vegetate and are about an inch high, they should be potted off into small pots, three or four plants in each, as recommended for heaths. The hard-wooded species have been by most cultivators considered very difficult to increase by cuttings, but if they be planted in sand in a brisk hotbed and left uncovered, they will root freely. Even pieces of considerable size of *Phænocoma prolifera*, one of the handsomest of the tribe, have been successfully propagated in this manner. These plants are much admired on account of the beauty of their flowers; and from the circumstance of their retaining their colours and perfect forms long after they are cut, they have obtained the name of everlasting flowers. Sandy peat soil is the most suitable for them when rooted, and the same after-treatment as recommended for *Ericas* will suit them.

ADENANDRA, BARYOSMA, AGATHOSMA, AND DIOSMA,

Were originally ranged under the genus *Diosma*. This is a section of handsome plants, bearing some resemblance to heaths, and flowering abundantly. To many the scent of this tribe is unpleasant, while with others it is quite the reverse. Cuttings of the tips of the young shoots root freely, planted in sand, and placed in a cool place under a bell glass. Many of them ripen their seeds in our gardens, from which a stock is soon procured. They prefer a soil similar to Heaths, and prosper best when treated in the same manner as that delightful family.

CORRÆA.

This genus strikes freely, if we except *C. speciosa*. The cuttings should be taken off the ripened wood, planted in sand in autumn, and allowed to stand till spring in a cool pit, when they should be placed upon a slight bottom heat and left uncovered; they will soon strike root, and may then be potted off into small pots, and hardened to stand in the greenhouse. *C. speciosa* is better to be enarched or grafted on stocks of *C. alba*; by this means large plants will be obtained in a short time. A light sandy

peat in well-drained pots is required for them; their other treatment differs not from that of plants admitted into the Heathery.

#### BORONIA.

This is a valuable genus, flowering nearly all the year. They are propagated by layers, and by ripened cuttings, and some of the more difficult rooting sorts are successfully enarched upon *B. alata*, which strikes more freely than others. Plants of these delicate habits seldom make fine specimens when propagated by layers; it is better, therefore, to endeavour to originate them either from cuttings or by enarching. The cuttings should be taken off at a joint, planted in sand, and placed in a moderately warm, but not hot place, and covered with a glass, which must be often removed to be cleared of damp. Light, turfy, sandy peat is the proper soil for them, and the greatest care must be taken that the pots be well drained, and in after-culture that they be not injured by having too much water. The treatment of the Heathery is the most proper for this fine genus.

#### CROWEA,

Is also a lovely genus and free flowerer. Cuttings of the young shoots strike freely when planted in sand, and left uncovered if in heat, but covered with a bell glass if kept in a cool situation.

#### ERIOSTEMON.

This is a difficult genus to cultivate. Imported seeds are sometimes obtained, but we have found them rather difficult to vegetate. Cuttings of the half-ripened wood have been struck under a glass in a light sandy soil. When seeds can be obtained, they should be sown in the same soil the plant is to be grown in, and as they sometimes remain a long time without vegetating, the seed pots should not be thrown away under eighteen months. Light, turfy peat soil, and the general treatment of the Heathery, is the best for them, taking care that they are not kept too damp.

The plants we have selected from the natural order Leguminosæ, viz., CYCLOPIA, OXYLOBIUM, GASTROLOBIUM, PULTENEA, AOTUS, EUTAXIA, DAVIESIA, CHORIZEMA, PODOLOBIUM, DILLWYNIA, GOMPHOLOBIUM, LIPARIA, BOSSIEA, PLATYLOBIUM, SCOTTIA, TEMPLETONIA, HOVEA, and LODDIGESIA, are all extremely beautiful, but are not by any means, if we except the last, easily multiplied otherwise than by seeds; all of them when old enough ripen seeds in this country, and seeds of most species are easily procured from New Holland, where most of them are indigenous.

It is a curious fact that few papilionaceous woody plants increase readily by cuttings, or the other ordinary means used, but all of them produce seeds in abundance, and these vegetate freely. The best mode of increasing the genera under consideration, is certainly by seeds; some of them will strike by cuttings, but it is both a tedious and precarious process; yet, nevertheless, we are often compelled to adopt it. Young wood is generally chosen, and that planted in sand under bell glasses is considered the best plan. The soil in which this splendid assemblage of plants seems to flourish is light, turfy peat, although *Chorizema* is often found to grow luxuriantly in a loamy soil. *Loddigesia* strikes root freely, the young shoots being planted in sand and a glass placed over them.

## SELECT LIST OF ERICAS, OR HEATHS.

## WHITE.

*Six to eighteen inches high.*

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|--|--|
| Clear-flowered. ( <i>E. perspicua</i> .) Flowers from March to June.   | Incurved. ( <i>E. incurva</i> .) Flowers from May to July.                 |
| Transparent. ( <i>E. transparens</i> .) Flowers in May.                | Woolly-flowered. ( <i>E. velleriflora</i> .) Flowers in June.              |
| Elongated. ( <i>E. elongata</i> .) Flowers from February to November.  | Brunia-like. ( <i>E. bruniades</i> .) Flowers from April to June.          |
| Bowie's. ( <i>E. Boweana</i> .) Flowers from August to December.       | Flaccid. ( <i>E. flaccida</i> .) Flowers in May.                           |
| Smooth. ( <i>E. glabra</i> .) Flowers from May to August.              | Six-parted. ( <i>E. sexfaria</i> .) Flowers from May to August.            |
| Irby's. ( <i>E. Irbyana</i> .) Flowers from June to October.           | Opposite-leaved. ( <i>E. oppositifolia</i> .) Flowers from March to May.   |
| Lady Shannon's. ( <i>E. Shannoniana</i> .) Flowers in June.            | Two-flowered. ( <i>E. biflora</i> .) Flowers from April to January.        |
| Lady Clifford's. ( <i>E. Cliffordiana</i> .)                           | Frothy. ( <i>E. spumosa</i> .) Flowers from May to August.                 |
| Excelling. ( <i>E. præstans</i> .) Flowers from June to November.      | Pyrola-flowered. ( <i>E. pyrolæflora</i> .) Flowers from May to July.      |
| Peaked. ( <i>E. fastigiata</i> .) Flowers from May to September.       | Lambert's. ( <i>E. Lambertiana</i> .) Flowers from May to August.          |
| Muscari. ( <i>E. Muscari</i> .) Flowers from March to July.            | Pearl-flowered. ( <i>E. margaritacea</i> .) Flowers from May to September. |
| Spruce. ( <i>E. trossula</i> .) Flowers from April to May.             | Softest. ( <i>E. mollissima</i> .) Flowers in May.                         |
| Three-flowered. ( <i>E. triflora</i> .) Flowers from March to June.    | Close-headed. <i>E. congesta</i> .) Flowers from June to July.             |
| Lachnea-leaved. ( <i>E. lachnæfolia</i> .) Flowers from May to July.   | Cestus-leaved. ( <i>E. cistifolia</i> .) Flowers from May to June.         |
| Black-tipped. ( <i>E. nigrita</i> .) Flowers from March to June.       | Perfumed. ( <i>E. odorata</i> .) Flowers from April to July.               |
| Wanton. ( <i>E. salax</i> .) Flowers from April to May.                | Pure. ( <i>E. pura</i> .) Flowers from August to September.                |
| Phyllica-like. ( <i>E. phyllicoides</i> .) Flowers from April to June. |  |

Crowded-flowered. (*E. conferta*.) Flowers from February to October.  
 Snowy. (*E. nivea*.) Flowers from April to May.  
 Villous. (*E. villosa*.) Flowers from February to June.  
 Heart-leaved. (*E. cordata*.) Flowers from April to June.  
 Reflexed. (*E. reflexa*.) Flowers from May to June.  
 White-anthered. (*E. leucanthera*.) Flowers from January to May.  
 Pitcher-flowered. (*E. urceolaris*.) Flowers from May to July.  
 Rising. (*E. assurgens*.) Flowers from May to June.  
 Caffrarian. (*E. caffra*.) Flowers from February to October.  
 Hoary. (*E. incana*.) Flowers from June to August.

Protruding. (*E. protrudens*.) Flowers from April to May.  
 Ziz-zag. (*E. flexuosa*.) Flowers from April to July.  
 Roughish. (*E. scabriuscula*.) Flowers from May to June.  
 Whitish. (*E. albens*.) Flowers from March to August.  
 Very-flowery. (*E. bryantha*.) Flowers from June to July.  
 Silver-flowered. (*E. argentiflora*.) Flowers from April to July.  
 Bearded. (*E. barbata*.) Flowers from May to August.  
 Retroflexed. (*E. retroflexa*.) Flowers from July to September.  
 Spear-leaved. (*E. lanceolata*.) Flowers from June to December.  
 Three-headed. (*E. triceps*.) Flowers from May to June.

*From eighteen inches and upwards.*

Pencilled-flowered. (*E. penicilliflora*.) Flowers from April to July.  
 Cylindrica. (*E. cylindrica*.) Flowers from May to June.  
 Softy. (*E. procera*.) Flowers from April to June.  
 Pellucid. (*E. pellucida*.) Flowers from June to November.  
 Coloring. (*E. colorans*.) Flowers from April to June.  
 Pine-leaved. (*E. pityophylla*.) Flowers from February to July.  
 Clothed. (*E. vestita*.) Flowers all the year.  
 Lady Monson's. (*E. Monsoniana*.) Flowers from April to September.  
 Dickenson's. (*E. Dickensonii*.) Flowers from May to August.  
 Jasmine-flowered. (*E. jasminiflora*.) Flowers from June to August.  
 Flask. (*E. ampullacea*.) Flowers from June to August.  
 Aiton's. (*E. Aitoniana*.) Flowers from June to September.  
 Conquering. (*E. triumphans*.) Flowers from May to June.  
 Bright. (*E. nitida*.) Flowers from July to October.

Tree. (*E. arborea*.) Flowers from February to June.  
 Meagre. (*E. strigosa*.) Flowers from April to July.  
 Marum-leaved. (*E. marifolia*.) Flowers from May to June.  
 Helianth-leaved. (*E. helianthemifolia*.) Flowers from February to April.  
 White-pencilled. (*E. penicilliflora*.) Flowers from May to August.  
 Villous. (*E. villosa*.) Flowers from February to June.  
 Sparrow-wort. (*E. passerina*.) Flowers from May to November.  
 Milk-flowered. (*E. lactiflora*.) Flowers from June to September.  
 Acute-angled. (*E. acutangula*.) Flowers from March to April.  
 Deflexed. (*E. deflexa*.) Flowers in July.  
 Whitish. (*E. albida*.) Flowers from May to September.  
 Bell-flowered. (*E. nolfiflora*.) Flowers from March to May.  
 Daphne-like. (*E. daphnoides*.) Flowers from May to June.

PURPLE.

*Six to eighteen inches high.*

Round-headed. (*E. cephalotes*.) Flowers from May to July.  
 Parcel-flowered. (*E. fascicularis*.) Flowers from February to June.  
 Diaphanous. (*E. diaphana*.) Flowers from June to July.  
 Trumpet-formed-flowered. (*E. bucciniformis*.) Flowers from June to July.

Niven's. (*E. Niveniana*.) Flowers from February to July.  
 Admirable. (*E. mirabilis*.) Flowers from May to June.  
 Turgid. (*E. turgida*.) Flowers from April to July.  
 Modest. (*E. modesta*.) Flowers from April to May.

Oval-flowered. (*E. ovaliflora*.) Flowers from June to July.  
 Cels's. (*E. Celsii*.) Flowers from June to July.  
 Yew-leaved. (*E. taxifolia*.) Flowers from July to November.  
 Fragrant. (*E. fragrans*.) Flowers from March to June.  
 Sub-bristly-stemmed. (*E. hispidula*.) Flowers from June to August.  
 Clustered. (*E. aggregata*.) Flowers from July to August.  
 Pleasing. (*E. amœna*.) Flowers from March to July.  
 Early. (*E. præcox*.) Flowers from January to March.  
 Garland-flower. (*E. persoluta*.) Flowers from February to May.

Pubescent. (*E. pubescens*.) Flowers from February to December.  
 Cube-flowered. (*E. cubica*.) Flowers from April to July.  
 Delicate. (*E. tenella*.) Flowers from May to August.  
 Linnæa-like. (*E. Linnæoides*.) Flowers from February to May.  
 Linnæus'. (*E. Linnæana*.) Flowers from January to May.  
 Cloth-flowered. (*E. pannosa*.) Flowers from February to June.  
 Woolly. (*E. lanuginosa*.) Flowers January to September.  
 Denticulated. (*E. denticulata*.) Flowers from April to May.  
 Cowslip-like. (*E. primuloides*.) Flowers from April.

*From eighteen inches and upwards.*

Rollinson's. (*E. Rollinsonii*.) Flowers from June to July.  
 Mammosc. (*E. mammosa*.) Flowers from July to October.  
 Glutinous. (*E. glutinosa*.) Flowers from July to October.  
 Varnish-flowering. (*E. verniciflora*.) Flowers from March to September.  
 Bandon's. (*E. Bandoniana*.) Flowers from July to August.  
 Neatish. (*E. mundula*.) Flowers from February to October.  
 Noble. (*E. nobilis*.) Flowers from April to July.  
 Large-calyxed. (*E. calycina*.) Flowers from May to July.  
 Oblique. (*E. obliqua*.) Flowers from May to July.

Shining. (*E. nitens*.) Flowers from June to September.  
 Tomentose. (*E. tomentosa*.) Flowers from June to July.  
 Star-bearing. (*E. stellifera*.) Flowers from April to July.  
 Constantia. (*E. Constantia*.) Flowers from March to August.  
 Pot-flowered. (*E. crossata*.) Flowers from May to June.  
 Graceful. (*E. decora*.) Flowers from January to November.  
 Small-branched. (*E. ramulosa*.) Flowers from June to July.  
 Umbelled. (*E. umbellata*.) Flowers from May to July.  
 Magnificent. (*E. magnifica*.) Flowers from August to November.

RED.

*Six to eighteen inches high.*

Plukenet's. (*E. Plukenetii*.) Flowers from April to July.  
 Blackmouthed. (*E. melastoma*.) Flowers from May to July.  
 Ignescens. (*E. ignescens*.) Flowers from March to June.  
 Glandulous-haired. (*E. glandulosa*.) Flowers from May to June.  
 Pellucida-like. (*E. pellucidoides*.) Flowers from August to November.  
 Sweating. (*E. exudans*.) Flowers from October to November.  
 Rusty. (*E. ferruginea*.) Flowers from May to July.  
 Pointed-leaved. (*E. acuminata*.) Flowers from July to October.  
 Dense. (*E. densa*.) Flowers from May to August.  
 Slender. (*E. tenuis*.) Flowers from July to August.

Tufted. (*E. comosa*.) Flowers from April to August.  
 Small-awned. (*E. aristella*.) Flowers from June to July.  
 July. (*E. Juliana*.) Flowers from July.  
 Red-bracted. (*E. bracteata*.) Flowers from May to June.  
 Gowned. (*E. togata*.) Flowers from June to July.  
 Channelled. (*E. canaliculata*.) Flowers from February to August.  
 Callous. (*E. callosa*.) Flowers from June to July.  
 Spot-flowered. (*E. guttaeflora*.) Flowers from May to August.  
 Side-flowered. (*E. lateralis*.) Flowers from March to July.  
 Savile's. (*E. Savileana*.) Flowers from June to July.

Panicked. (*E. paniculata*.) Flowers from February to April.  
 Mucous. (*E. mucosa*.) Flowers from February to August.  
 Ramentaceous. (*E. ramentacea*.) Flowers from July to December.  
 Slenderest. (*E. tenuissima*.) Flowers from February to August.  
 Approximate, (*E. approximata*.) Flowers from May to July.

Regerminating. (*E. regerminans*.) Flowers from May to August.  
 Little tree. (*E. arbuscula*.) Flowers from February to August.  
 Pretty. (*E. pulchella*.) Flowers from June to September.  
 Beautiful. (*E. bella*.) Flowers from January to October.

*From eighteen inches and upwards.*

Showy. (*E. speciosa*.) Flowers from June to September.  
 Translucent. (*E. translucens*.) Flowers from May to August.  
 Three-leaved. (*E. triphylla*.) Flowers from July to November.  
 Long-leaved. (*E. longifolia*.) Flowers from February to July.  
 Pine-leaved. (*E. pinea*.) Flowers from August to December.  
 Flax-like. (*E. linoides*.) Flowers from July to September.  
 Masson's. (*E. Massoni*.) Flowers from July to October.  
 Pectinated-leaved. (*E. pectinifolia*.) Flowers from June to November.  
 Swainson's. (*E. Swainsoni*.) Flowers from July to October.  
 Three-coloured. (*E. tricolor*.) Flowers from June to July.

Temple's. (*E. Templeana*.) Flowers from July to August.  
 Swelled. (*E. pragnans*.) Flowers from May to July.  
 Ampullacea-like. (*E. ampullaceoides*.) Flowers from May to July.  
 Broadley's. (*E. Broadleyana*.) Flowers from May to July.  
 Solander's. (*E. Solandra*.) Flowers from August to November.  
 Mitre-formed. (*E. mitreiformis*.) Flowers from June to July.  
 Broad-leaved. (*E. latifolia*.) Flowers from May to August.  
 Clammy-flowered. (*E. viscaria*.) Flowers from March to July.  
 Handsome. (*E. formosa*.) Flowers from June to September.  
 Canescent. (*E. canescens*.) Flowers from March to October.

PALE RED.

*Six to eighteen inches high.*

Pale. (*E. pallens*.) Flowers from June to August.  
 Flesh-coloured. (*E. incarnata*.) Flowers from February to June.

Meagre. (*E. strigosa*.) Flowers from March to April.  
 Funnel-shaped. (*E. infundibuliformis*.) Flowers from August to November.

ORANGE.

*Six to eighteen inches high.*

Saw-leaved. (*E. serratifolia*.) Flowers from August to December.  
 Sparmann's. (*E. Sparmanni*.) Flowers from March to September.  
 Rising. (*E. exurgens*.) Flowers all the year.  
 Ninepin-flowered. (*E. metulæflora*.) Flowers from June to August.

Thunberg's. (*E. Thunbergia*.) Flowers from May to August.  
 Seba's. (*E. Sebana*.) Flowers from March to June.  
 Changing-coloured. (*E. versicolor*.) Flowers from May to November.  
 Hibbert's. (*E. Hibbertiana*.) Flowers from June to September.

*From eighteen inches and upwards.*

Painted. (*E. picta*.) Flowers from July to October.  
 Patersonia-like. (*E. Patersonioides*.) Flowers from April to August.  
 Gold-coloured. (*E. aurea*.) Flowers from July to September.

Lee's. (*E. Leeana*.) Flowers from July to August.  
 Tall. (*E. elata*.) Flowers from July to September.



## YELLOW.

*From six to eighteen inches high.*

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| <p>Virescent. (<i>E. virescens</i>.) Flowers in May.</p> <p>Dull-yellow. (<i>E. gilva</i>.) Flowers from May to June.</p> <p>Onosma-flowered. (<i>E. onosmæflora</i>.) Flowers from March to September.</p> <p>Rough. (<i>E. aspera</i>.) Flowers from May to June.</p> <p>Red nightshade. (<i>E. Halicacaba</i>.) Flowers from May to August.</p> <p>Yellow. (<i>E. lutea</i>.) Flowers from February to May.</p> <p>Bonpland's. (<i>E. Bonplandiana</i>.) Flowers from March to September.</p> <p>Downy-headed. (<i>E. capitata</i>.) Flowers from March to July.</p> | <p>Lord Blandford's. (<i>E. Blandfordiana</i>.) Flowers from March to June.</p> <p>Bell-flowered. (<i>E. campanulata</i>.) Flowers from April to August.</p> <p>Three-leaved-yellow. (<i>E. flava</i>.) Flowers from April to September.</p> <p>Interwoven. (<i>E. intertexa</i>.) Flowers from June to July.</p> <p>Thalictrum-flowered. (<i>E. thalictriflora</i>.) Flowers from March to May.</p> <p>Depressed. (<i>E. depressa</i>.) Flowers from June to August.</p> <p>Dwarf. (<i>E. nana</i>.) Flowers from May to August.</p> |
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*From eighteen inches and upwards.*

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|--|--|
| <p>Petiver's. (<i>E. Petiverii</i>.) Flowers from March to July.</p> <p>Great-flowered. (<i>E. grandiflora</i>.) Flowers from May to September.</p> <p>Spout-flowered. (<i>E. epistomia</i>.) Flowers from May to June.</p> <p>Spiked. (<i>E. spicata</i>.) Flowers all the year.</p> <p>Paterson's. (<i>E. Patersoniana</i>.) Flowers from March to August.</p> | <p>Sulphur. (<i>E. sulphurea</i>.) Flowers from June to July.</p> <p>Curve-flowered. (<i>E. curviflora</i>.) Flowers from July to October.</p> <p>Sprengel's. (<i>E. Sprengelii</i>.) Flowers from June to July.</p> <p>Flat-flowered. (<i>E. complanata</i>.) Flowers from May to July.</p> |
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## SCARLET.

*Six to eighteen inches high.*

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| <p>Expanded. (<i>E. expansa</i>.) Flowers from May to September.</p> <p>Pinaster-leaved. (<i>E. pinastrifolia</i>.) Flowers from July to August.</p> <p>Gem-bearing. (<i>E. gemmifera</i>.) Flowers from May to July.</p> | <p>Princely. (<i>E. princeps</i>.) Flowers from May to July.</p> <p>Tumid. (<i>E. tumida</i>.) Flowers from May to September.</p> <p>Echium-flowered. (<i>E. echiiflora</i>.) Flowers from February to June.</p> |
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*From eighteen inches and upwards.*

- |   |   |
|---|---|
| <p>Whorled. (<i>E. verticillata</i>.) Flowers from July to October.</p> <p>Choice-red. (<i>E. eximia</i>.) Flowers from June to July.</p> <p>Shining. (<i>E. splendens</i>.) Flowers from April to September.</p> <p>Refulgent. (<i>E. refulgens</i>.) Flowers from April to July.</p> <p>Honeywort-like. (<i>E. cerinthoides</i>.) Flowers from May to November.</p> | <p>Glowing. (<i>E. ardens</i>.) Flowers from April to June.</p> <p>Lady Archer's. (<i>E. Archeriana</i>.) Flowers from August to November.</p> <p>Wooly-flowered. (<i>E. laniflora</i>.) Flowers from March to August.</p> <p>Imperial. (<i>E. imperialis</i>.) Flowers from May to July.</p> |
|---|---|

## GREEN.

*Six to eighteen inches high.*

- |  |   |
|--|---|
| Hanging down. ( <i>E. demissa</i> .) Flowers from April to May.          | Musk-scented. ( <i>E. moschata</i> .) Flowers from May to July. |
| Clubbed. ( <i>E. clavata</i> .) Flowers from July to August.             | Elegant. ( <i>E. elegans</i> .) Flowers from March to November. |
| Club-flowered. ( <i>E. clavæflora</i> .) Flowers from August to October. | Pilose. ( <i>E. pilosa</i> .) Flowers from June to July.        |

*From eighteen inches and upwards.*

- |   |   |
|---|---|
| Sandal-flowered. ( <i>E. socciflora</i> .) Flowers from April to May.       | Green-flowered. ( <i>E. viridis</i> .) Flowers from May to September. |
| Ice-cold. ( <i>E. gelida</i> .) Flowers from April to July.                 | Two-colour. ( <i>E. bicolor</i> .) Flowers from March to October.     |
| Green and purple. ( <i>E. viridipurpurea</i> .) Flowers from May to August. | Broom. ( <i>E. scoparia</i> .) Flowers from April to May.             |

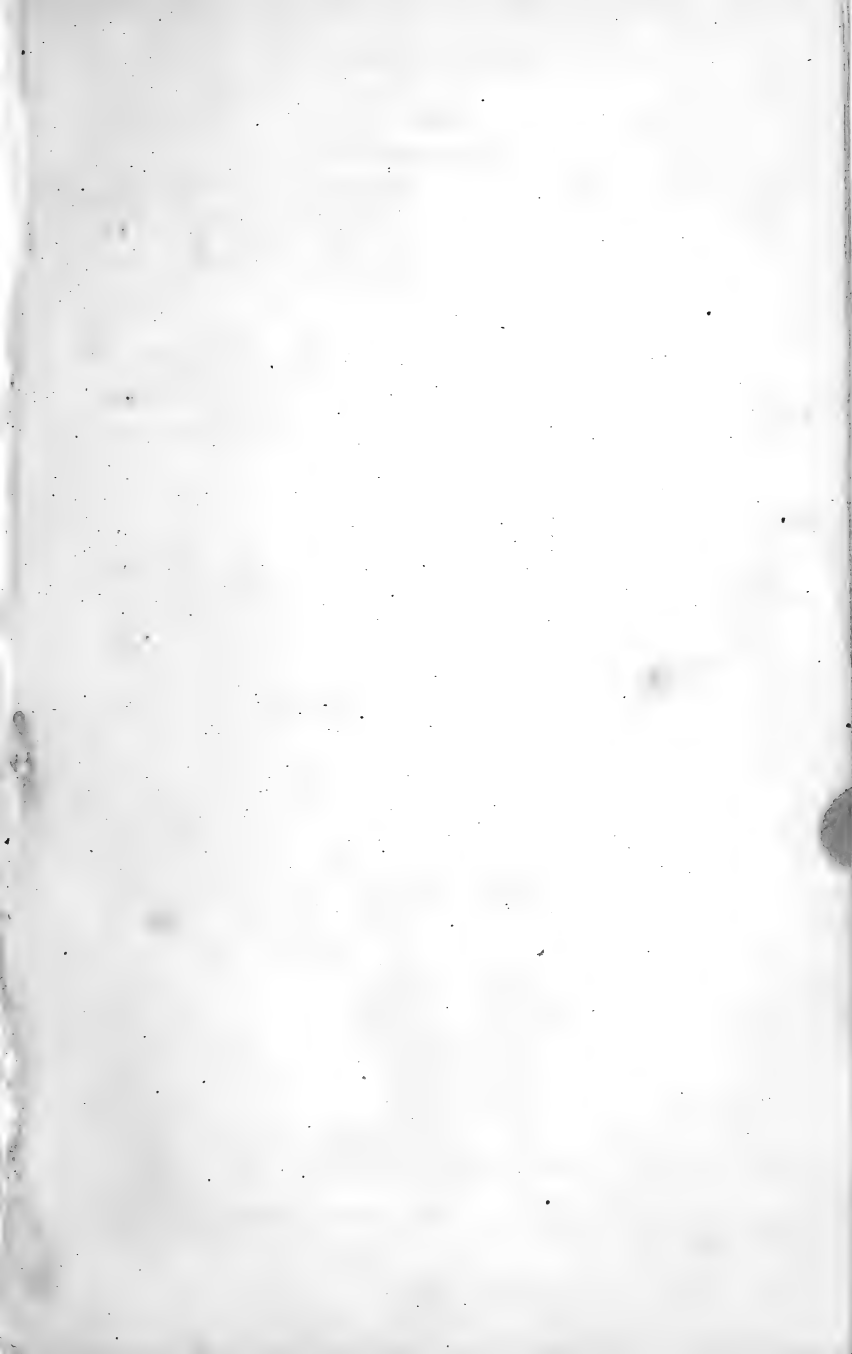
## CRIMSON.

*Six to eighteen inches high.*

- |   |   |
|---|---|
| Bloody. ( <i>E. sanguinea</i> .) Flowers all the year.              | Radiated. ( <i>E. radiata</i> .) Flowers from August to November. |
| Mutable. ( <i>E. mutabilis</i> .) Flowers from February to October. |   |



A Heath, showing Mr. M'Nab's manner of potting.





*Chorizanthe floribunda*  
*apocynifolia*

*Asclepias glandulifera*  
*peruviana*

## SELECT LIST OF PLANTS,

REQUIRING THE SAME TREATMENT AS

## ERICA,

AND CALCULATED TO BE GROWN IN THE SAME STRUCTURE.

- 
- Side-flowering *Dracophyllum*. (*Dracophyllum secundum*.) Flowers in April and August, in sandy peat. Suckers.
- Long-leaved *Dracophyllum*. (*Dracophyllum longifolium*.) Flowers in April and August, in sandy peat. Cuttings.
- Slender *Dracophyllum*. (*Dracophyllum gracile*.) Flowers in April and May, in sandy peat. Cuttings.
- Pungent *Lysinema*. (*Lysinema pungens*.) Flowers in February and April, in loam and peat. Cuttings.
- Attenuated *Lysinema*. (*Lysinema attenuatum*.) Flowers in February and April, in loam and peat. Cuttings.
- Scattered *Epacris*. (*Epacris sparsa*.) Flowers in April and June, in sandy peat. Cuttings.
- Drawn-out *Epacris*. (*Epacris exserta*.) Flowers in April and June, in loam and peat. Cuttings.
- Jamaica albescent *Gnaphalium*. (*Gnaphalium albescens*.) Flowers in July and August, in common loam.
- Spherical *Gnaphalium*. (*Gnaphalium sphericum*.) Flowers in July and August, in common mould. Divisions.
- Diosma-leaved *Helichrysum*. (*Helichrysum diosmaefolium*.) Flowers in March and August, in common mould. Cuttings.
- Helianthemum-leaved *Helichrysum*. (*Helichrysum helianthemifolium*.) Flowers in July and October, in common loam. Cuttings.
- Whitened *Helichrysum*. (*Helichrysum dealbatum*.) Flowers all the year, in common loam. Cuttings.
- Silvery *Helichrysum*. (*Helichrysum argenteum*.) Flowers in April and June, in common loam. Cuttings.
- Rigid-leaved *Helichrysum*. (*Helichrysum rigidum*.) Flowers in May and June, in common loam. Cuttings.
- Panicked *Helichrysum*. (*Helichrysum paniculatum*.) Flowers in June and September, in common loam. Cuttings.
- Heath-like *Aphelaxis*. (*Aphelaxis ericoides*.) Flowers in April and June, in sandy peat. Cuttings.
- Acuminate *Adenandra*. (*Adenandra acuminata*.) Flowers in April and July, in peat and loam. Cuttings.
- Four-angled *Adenandra*. (*Adenandra tetragona*.) Flowers in April and June, in peat and loam. Cuttings.
- Sweet-scented *Baryosma*. (*Baryosma odorata*.) Flowers in April and July, in peat and loam. Cuttings.
- Crenated *Baryosma*. (*Baryosma crenata*.) Flowers in January and March, in peat and loam. Cuttings.
- Birch-leaved *Baryosma*. (*Baryosma betulina*.) Flowers in April and June, in peat and loam. Cuttings.
- Broad-leaved *Agathosma*. (*Agathosma latifolia*.) Flowers in July and August, in peat and loam. Cuttings.
- Ciliated *Agathosma*. (*Agathosma ciliata*.) Flowers in April and May, in peat and loam. Cuttings.
- Wrinkled *Agathosma*. (*Agathosma rugosa*.) Flowers in April and June, in peat and loam. Cuttings.
- Bearded *Agathosma*. (*Agathosma barbata*.) Flowers in April and June, in peat and loam. Cuttings.
- Clothed *Agathosma*. (*Agathosma vestita*.) Flowers in April and June, in peat and loam. Cuttings.
- Pubescent *Agathosma*. (*Agathosma pubescens*.) Flowers in May and August, in peat and loam. Cuttings.

Flax-leaved Agathosma. (*Agathosma linifolia*.) Flowers in April and June, in peat and loam. Cuttings.  
 Succulent-leaved Diosma. (*Diosma succulenta*.) Flowers in April and June, in peat and loam. Cuttings.  
 White-flowered Diosma. (*Diosma alba*.) Flowers in March and July, in peat and loam. Cuttings.  
 Four-angled Diosma. (*Diosma tetragona*.) Flowers in July and August, in peat and loam. Cuttings.

Slenderest Diosma. (*Diosma tenuissima*.) Flowers in April and July, in peat and loam. Cuttings.  
 Delicate Diosma. (*Diosma tenella*.) Flowers in April and July, in peat and loam. Cuttings.  
 Ledum-leaved Boronia. (*Boronia ledifolia*.) Flowers in March and April, in sandy peat. Cuttings.  
 Corymbose Daviesia. (*Daviesia corymbosa*.) Flowers in May and August, in sandy loam and peat. Cuttings.

## WHITE.

From three to six feet high.

Blunt-leaved Epacris. (*Epacris obtusifolia*.) Flowers in April and June, in sandy peat. Cuttings.  
 Various-stamened Epacris. (*Epacris heteronema*.) Flowers in April and July, in sandy peat. Cuttings.  
 Great-flowered Helichrysum. (*Helichrysum grandiflorum*.) Flowers in January and August, in sandy peat. Cuttings.  
 Tree Helichrysum. (*Helichrysum arboreum*.) Flowers in February and August, in sandy peat. Cuttings.  
 Spreading Helichrysum. (*Helichrysum patulum*.) Flowers in January

and August, in sandy peat. Cuttings.  
 Woolly-stemmed Helichrysum. (*Helichrysum lasiocaulon*.) Flowers in January and August, in sandy peat. Cuttings.  
 Opposite-leaved Diosma. (*Diosma oppositifolia*.) Flowers in March and July, in peat and loam. Cuttings.  
 Subulate Diosma. (*Diosma subulata*.) Flowers in March and July, in peat and loam. Cuttings.  
 White Corræa. (*Corræa alba*.) Flowers in April and June, in sandy peat. Cuttings.

## RED.

From one to three feet high.

Onosma-flowered Epacris. (*Epacris onosmæflora*.) Flowers in April and June, in sandy peat. Cuttings.  
 Fiery-flowered Helichrysum. (*Helichrysum ignescens*.) Flowers in June and October, in sandy peat. Cuttings.  
 Shining-flowered Helichrysum. (*Helichrysum rutilans*.) Flowers in June and August, in sandy peat. Cuttings.  
 Pleasing Adenandra. (*Adenandra amœna*.) Flowers in April and June, in peat and loam. Cuttings.  
 Red Diosma. (*Diosma rubra*.) Flowers in March and May, in peat and loam. Cuttings.  
 Flesh-coloured Pultenæa. (*Pultenæa incarnata*.) Flowers in April and June, in sand, loam, and peat. Cuttings.  
 Retuse-leaved Templetonia. (*Templetonia retusa*.) Flowers in March

and January, in sandy peat. Cuttings.  
 Glaucous Templetonia. (*Templetonia glauca*.) Flowers in April and May, in sand and peat. Cuttings.  
 Winged Boronia. (*Boronia alata*.) Flowers in March and January, in sandy peat. Cuttings.  
 Willow-leaved Eriostemon. (*Eriostemon salicifolius*.) Flowers in April and June, in sandy peat and loam. Cuttings.  
 Heath-leaved Eriostemon. (*Eriostemon ericifolius*.) Flowers in April and August, in sand, loam, and peat. Cuttings.  
 Lanceolate Eriostemon. (*Eriostemon lanceolatus*.) Flowers in April and August, in sand, loam, and peat. Cuttings.  
 Tooth-leaved Scottia. (*Scottia dentata*.) Flowers in June and September, in sandy peat. Cuttings.

From three to six feet high.

Small-pointed Epacris. (*Epacris mucronulata*.) Flowers in April and July, in sandy peat. Cuttings.  
Marsh Epacris. (*Epacris paludosa*.) Flowers in April and July, in sandy peat. Cuttings.

Linear-leaved Eriostemon. (*Eriostemon linearifolius*.) Flowers in April and August, in sandy peat. Cuttings.

#### YELLOW.

From one to three feet high.

American Gnaphalium. (*Gnaphalium americanum*.) Flowers in July and August, in sandy loam. Cuttings.

Waved Gnaphalium. (*Gnaphalium undulatum*.) Flowers in January and August, in common loam. From seeds.

Sweetest-scented Helichrysum. (*Helichrysum odoratissimum*.) Flowers in April and August, in sandy peat. Cuttings.

Shining Helichrysum. (*Helichrysum fulgidum*.) Flowers in February and October, in common loam. Cuttings.

Herbaceous Helichrysum. (*Helichrysum herbaceum*.) Flowers in July and September, in common loam. Seeds.

Spiny Oxylobium. (*Oxylobium spinosum*.) Flowers in April and June, in sandy peat. Cuttings.

Two-lobed Gastrolobium. (*Gastrolobium bilobum*.) Flowers in March and May, in sand, loam, and peat. Cuttings.

Pultenæa. The whole of this beautiful and interesting genus belongs to this section, with the solitary exception of *P. incarnatum*; their flowers are all yellow; they are all increased by cuttings and seeds, and require a soil composed of sandy loam and peat, and flower between April and July. The same may be said of the genera AOTUS, DILLWYNIA, GOMPHOLOBIUM.

From three to six feet high.

Shrubby Helichrysum. (*Helichrysum fruticans*.) Flowers in January and August, in common loam. Cuttings.

Cineros Helichrysum. (*Helichrysum tephrodes*.) Flowers in January and August, in sandy peat. Cuttings.

Broad-leaved Daviesia. (*Daviesia latifolia*.) Flowers in May and August, in sand, loam and peat. Cuttings.

Furze-leaved Daviesia. (*Daviesia ulicina*.) Flowers in April and August, in sand, loam, and peat. Cuttings.

Winged Daviesia. (*Daviesia alata*.) Flowers in May and August, in sand, loam, and peat. Cuttings.

Various-leaved Podolobium. (*Podolobium heterophyllum*.) Flowers in April and July, in sand and peat. Cuttings.

Climbing Podolobium. (*Podolobium scandens*.) Flowers in April and June, in sand and peat. Cuttings.

Sword Bossiæa. (*Bossiæa ensata*.) Flowers in May and June, in sand, loam, and peat. Cuttings.

Round-leaved Bossiæa. (*Bossiæa*

*rotundifolia*.) Flowers in May and June, in sand, loam, and peat. Cuttings.

Heart-leaved Oxylobium. (*Oxylobium cordifolium*.) Flowers in April and September, in sandy peat. Cuttings.

Arborescent Oxylobium. (*Oxylobium arborescens*.) Flowers in April and July, in sandy peat. Cuttings.

Genista-like Cyclopia. (*Cyclopia genistoides*.) Flowers in July and August, in peat and loam. Cuttings.

Broad-leaved Cyclopia. (*Cyclopia latifolia*.) Flowers in July and August, in peat and loam. Cuttings.

Box-leaved Bossiæa. (*Bossiæa buxifolia*.) Flowers in May and June, in sand, loam, and peat. Cuttings.

Leafy Bossiæa. (*Bossiæa foliosa*.) Flowers in May and July, in sand, loam, and peat.

Small-leaved Bossiæa. (*Bossiæa microphylla*.) Flowers in May and August, in sand, loam, and peat. Cuttings.

## PURPLE.

*From one to three feet high.*

- |   |  |
|---|--|
| <p>Heath-leaved Blæria. (<i>Blæria ericoides</i>.) Flowers in August and October, in sandy peat. Cuttings.</p> <p>Mossy Blæria. (<i>Blæria muscosa</i>.) Flowers in January and August, in loam and peat. Cuttings.</p> <p>Purple-flowered Blæria. (<i>Blæria purpurea</i>.) Flowers in May and June, in sandy peat. Cuttings.</p> <p>Capitate Diosma. (<i>Diosma capitata</i>.) Flowers in May and June, in peat and loam. Cuttings.</p> <p>Pinnated-leaved Boronia. (<i>Boronia pinnata</i>.) Flowers in February and March, in sandy peat. Cuttings.</p> <p>Oxalis-leaved Loddigesia. (<i>Loddigesia oxalidifolia</i>.) Flowers in May and</p> | <p>September, in peat and loam. Cuttings.</p> <p>Sesamum-like Aphelexis. (<i>Aphelexis sesamoides</i>.) Flowers in April and June, in sandy peat. Cuttings.</p> <p>Fascicled Aphelexis. (<i>Aphelexis fasciculata</i>.) Flowers in March and September, in sandy peat. Cuttings.</p> <p>Obtuse-leaved Agathosma. (<i>Agathosma obtusa</i>.) Flowers in April and January, in peat and loam. Cuttings.</p> <p>Hairy Agathosma. (<i>Agathosma hirta</i>.) Flowers in April and January, in peat and loam. Cuttings.</p> <p>Short-leaved Agathosma. (<i>Agathosma brevifolia</i>.) Flowers in April and June, in loam and peat. Cuttings.</p> |
|---|--|

*From three to six feet high.*

- |  |  |
|--|--|
| <p>Purpurescents Epacris. (<i>Epacris purpurescens</i>.) Flowers in January and March, in sandy peat. Cuttings.</p> <p>Close-headed Helichrysum. (<i>Helichrysum congestum</i>.) Flowers in May and June, in sandy peat. Cuttings.</p> <p>Pretty Agathosma. (<i>Agathosma pulchella</i>.) Flowers in February and September, in peat and loam. Cuttings.</p> <p>Long-leaved Hovea. (<i>Hovea longifolia</i>.) Flowers in June and September, in sandy peat. Cuttings.</p> <p>Rosemary-leaved Hovea. (<i>Hovea rosmarinifolia</i>.) Flowers in March and July, in sandy peat. Cuttings.</p> | <p>Linear-leaved Hovea. (<i>Hovea linearis</i>.) Flowers in March and July, in sandy peat. Cuttings.</p> <p>Purple Hovea. (<i>Hovea purpurea</i>.) Flowers in March and July, in sandy peat. Cuttings.</p> <p>Wool-bearing Hovea. (<i>Hovea lanigera</i>.) Flowers in March and July, in sandy peat. Cuttings.</p> <p>Willow-leaved Crowea. (<i>Crowea saligna</i>.) Flowers in July and December, in sand, loam, and peat. Cuttings.</p> <p>Broad-leaved Crowea. (<i>Crowea latifolia</i>.) Flowers in July, in sand, loam, and peat. Cuttings.</p> |
|--|--|

## PINK OR ROSE.

*From one to three feet high.*

- |   |   |
|---|---|
| <p>Jointed Blæria. (<i>Blæria articulata</i>.) Flowers in May and June, in sandy peat. Cuttings.</p> <p>Sprengelia-like Andersonia. (<i>Andersonia sprengelioides</i>.) Flowers in March and July, in sandy peat. Cuttings.</p> <p>Five-petaled Lysinema. (<i>Lysinema pentapetalum</i>.) Flowers in February and March, in loam and peat. Cuttings.</p> <p>Hairy-flowered Lysinema. (<i>Lysinema lasianthum</i>.) Flowers in February and May, in loam and peat. Cuttings.</p> | <p>Heath-like Helichrysum. (<i>Helichrysum ericoides</i>.) Flowers in March and August, in common loam. Cuttings.</p> <p>Humble Aphelexis. (<i>Aphelexis humilis</i>.) Flowers in May and June, in sandy peat. Cuttings.</p> <p>One-flowered Adenandra. (<i>Adenandra uniflora</i>.) Flowers in April and July, in peat and loam. Cuttings.</p> <p>Showy Adenandra. (<i>Adenandra speciosa</i>.) Flowers in April and July, in peat and loam. Cuttings.</p> |
|---|---|



Margined Adenandra. (*Adenandra marginata*.) Flowers in March and July, in peat and loam. Cuttings.  
Cypress-leaved Diosma. (*Diosma*

*cupressina*.) Flowers in June and July, in peat and loam. Cuttings.  
Box-leaved Eriostemon. (*Eriostemon buxifolius*.) Flowers in May, in peat and loam. Cuttings.

*From three to six feet high.*

Neat Epacris. (*Epacris pulchella*.) Flowers in April and June, in sandy peat. Cuttings.  
Three-flowered Styphelia. (*Styphelia triflora*.) Flowers in May and August, in sandy peat. Cuttings.  
Broad-leaved Styphelia. (*Styphelia latifolia*.) Flowers in May and July, in sandy peat. Cuttings.  
Curled Helichrysum. (*Helichrysum*

*crispum*.) Flowers in January and August, in common loam. Cuttings.  
Fragrant Adenandra. (*Adenandra fragrans*.) Flowers in May and July, in peat and loam. Cuttings.  
Saw-leaved Baryosma. (*Baryosma ser-ratifolia*.) Flowers in March and January, in peat and loam. Cuttings.

SCARLET.

*From one to three feet high.*

Trailing Astroloma. (*Astroloma humifusum*.) Flowers in May and October, in sandy peat. Cuttings.  
Blunt-leaved Oxylobium. (*Oxylobium obtusifolium*.)

Henchmann's Chorizema. (*Chorizema Henchmannii*.) Flowers in April and June, in sandy peat. Cuttings.

*From three to six feet high.*

Showy Corraëa. (*Corraëa speciosa*.) Flowers in April and June, in sandy peat. Cuttings.  
Pretty Corraëa. (*Corraëa pulchella*.)

Flowers in April and July, in sandy peat. Cuttings.  
Serulated Boronia. (*Boronia serulata*.) Flowers in June and July, in sandy peat. Cuttings.

ORANGE.

*From one to three feet high.*

Retuse-leaved Oxylobium. (*Oxylobium retusum*.) Flowers in April and May, in peat and loam. Cuttings.  
Pulteney's Oxylobium. (*Oxylobium Pultenæa*.) Flowers in March, in sandy peat. Cuttings.  
Myrtle-leaved Eutoxia. (*Eutoxia myrtifolia*.) Flowers in August, in sand, loam, and peat. Cuttings.

Flax-leaved Bossiæa. (*Bossiæa linophylla*.) Flowers in June and September, in sand, loam, and peat. Cuttings.  
Ovate-leaved Flat Pea. (*Platylobium ovatum*.) Flowers in January and September, in sand, loam, and peat. Seeds.

*From three to six feet high.*

Beautiful Flat Pea. (*Platylobium formosum*.) Flowers in January and August, in sandy peat. Seeds.  
Small-flowered Flat Pea. (*Platylobium parviflorum*.) Flowers in May and

September, in sandy peat. Cuttings.  
Globe-flowered Liparia. (*Liparia sphaerica*.) Flowers in July and August, in peat and loam. Cuttings.

## CRIMSON.

*From one to three feet high.*

Bloody Gnaphalium. (*Gnaphalium sanguineum*.) Flowers in May and July, in common loam. Seeds.

*From three to six feet high.*

Impressed Epacris. (*Epacris impressa*.) Flowers in April and July, in sandy peat. Cuttings.

Proliferous Phænocoma. (*Phænocoma prolifera*.) Flowers in August and November, in sandy peat. Cuttings.

Tube-flowered Styphelia. (*Styphelia tubiflora*.) Flowers in May and August, in sandy peat. Seeds.

Epacris-like Styphelia. (*Styphelia epacroides*.) Flowers in July and August, in sandy peat. Cuttings.

## THE GERANIUM HOUSE.

THE late Mr. Colville was amongst the first who saw the propriety and adopted the practice of growing the *Geraniaceæ* in a house by themselves. Since that time many have followed the example, and, judging from the fine specimens brought to the public plant exhibitions within these last three years, we are led to think that in no department of plant culture has such a rapid improvement been made as in that of *Pelargoniums*. To grow these numerous and splendid plants to perfection, requires a separate house for themselves, and whoever has seen those of Hill, at Hammersmith, Cox, of Chiswick, and Gaines, of Battersea, as public cultivators, and those of Sir John Broughton, or R. Jenkinson, Esq., will admit, we think, that they richly deserve a house for themselves. The *Geraniaceæ* have the following attractions, namely, they are easily kept, propagated, and flowered; they continue nearly the whole season in bloom; present almost infinite variety of colour and form, and are much better adapted for standing in rooms uninjured than most other plants. New varieties are readily originated by cross impregnation, and these are readily increased by cuttings, the simplest of all modes of re-production. If the majority of *Pelargoniums* are deficient in fragrance, nature has made up for that apparent deficiency, by the splendour of the blossoms; and, as it were, to equalise her gifts, certain kinds whose flowers are less showy, nay, even of a dingy hue, have a delightful perfume; some during the evening and night, and others when rubbed against, or when the wind lashes the leaves and branches against each other.

Few genera of plants exhibit more fully the industry of the cultivator, or demonstrate more clearly the control he exercises in producing varieties, than in the case of the *Geranium* or *Pelargonium*. Hundreds of varieties, which are to be met with in the collections of florists, are the fruits of his ingenuity; for, however strange it may appear, it is a positive fact that not above a dozen true species are to be recognised amongst them. It is, therefore, now only in the strictly botanical collections that true species are to be seen, they having given place to sub-species originated by hybridizing. With the exception of three or four species, the whole of this splendid tribe, amounting to nearly three hundred recorded species, and above five hundred sub-varieties, have been

either introduced or originated in this country within the last fifty or sixty years.

The term *Pelargonium* is derived from the Greek name for a stork's bill, in allusion to the seed vessel, which resembles the beak of that bird : it was separated from the *Geranium* by the late learned Monsieur l'Héritier, as was the *Erodium*, which was formerly included under the general name of *Geranium* also ; for although we are in the very general habit of using the term *geranium*, *geranium house*, &c., when alluding to *Pelargoniums*, we must admit that this is an inaccuracy of expression which has nothing but habit to sanction it.

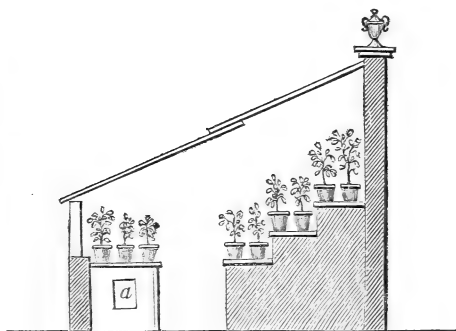
The late excellent and learned Sir James Edward Smith appears to have entertained no very high opinion of hybrid varieties of this family. "This vast and favourite genus," says he, "for which we are almost entirely indebted to the Cape of Good Hope, consists of a number of well-marked species. But that number is greatly augmented in almost every book, by the admission of spurious hybrid species or varieties, which continually start up from seed, wherever many of the primary ones are cultivated, and are for a while propagated by cuttings and even by seed ; sooner or later however, they, for the most part, vanish before the eyes of those who witnessed their origin." Great confusion has arisen in botanical works, for which the authors are much to blame, in consequence of admitting sub-varieties of known hybrid production, and also by registering many very doubtful ones in their works as species, for it must be allowed, that admitting them into works of science is replete with the greatest inconvenience.

#### STRUCTURES CALCULATED FOR THE GROWTH OF GERANIACEÆ.

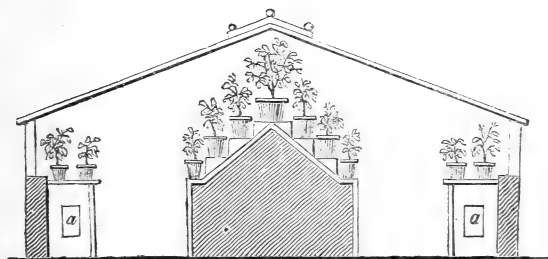
Any ordinary greenhouse, not too lofty, and capable of being completely ventilated, and situated in full exposure to the meridian sun, will answer very well for the culture of this tribe. But if a house were to be erected on purpose, one or other of the annexed figures, we should say, would be a perfect model. As the plants of this family require all the light, air, and sun, that our climate affords, it is necessary that the *Geranium house* should front the south, and be perfectly free from the shade of trees or buildings.

A very complete *Geranium house* may be upon the same scale of size, and constructed as that recommended for a *Heathery*, and may be attached

to it, thus forming a pretty range, which, in consequence of the plants being for the most part natives of the same country, will associate well together; or the Geranium house may be erected against the Camellia house, providing that the latter be detached from the dwelling house, and



occupying the north aspect of a separate wall. One remark we shall here make respecting the erection of plant houses in which small plants are to be cultivated.



Heaths, Geraniums, and most fine flowering greenhouse plants, should never be allowed to become old or large, as such plants, for the most part, do not flower so fine nor look so well, as young plants do. Houses of this description should be rather long and narrow, because in that case the plants are more within reach, and are much better seen than

when they are placed too far from the eye, which they often are when the house is either too lofty or too wide.

In our estimation the last figure would be a very complete Geranium house, and would be an object both light and elegant in the flower garden if placed detached from other buildings, or it would be equally well placed, if more desirable, when attached to the dwelling by one of its ends. The height of such a house should not exceed seven feet over the foot paths, which will be sufficient to admit of a free passage; for the lower such houses are, the better, so that there be plenty of head room. The length of all plant houses must be determined by local circumstances; but so far as heating is concerned, and we think it proper to mention that here, one fire, whether employed to heat a boiler of water or warm the smoke flues, (*a*) will heat a house of this width and height, above one hundred feet in length. A span-roofed house we prefer for geraniums, as the plants enjoy plenty of air, light, and solar influence, and are seen to great advantage. A span-roofed house, similar to that represented by the above section, if fifty feet in length, will contain nearly as many plants as one in the lean-to fashion of one hundred feet in length; and in regard to expense of erection will be much less.

In speaking of shading the most delicate heaths during the heat of summer, we would also recommend the same provision to be used for the geranium house, while the plants are in bloom. This expense will be amply remunerated by the greater length of time the plants will remain in bloom, and the richness of the colours of the flowers, which, if exposed to the full solar influence, would be very much injured. The upright lights over the parapet walls should be made to take out, as during a great part of the season they will be better removed, in order that a free circulation of air be permitted to pass through the house; but they should be replaced in stormy, windy weather. This mode of ventilation will render the opening the roof seldom necessary, guarding also against sudden showers of rain, which would be very injurious to the finest flowers.

#### PROPAGATION AND TREATMENT WHILE YOUNG.

Geraniums or, more properly, Pelargoniums, are very readily propagated by cuttings and seeds, and the tuberous-rooted sorts by cuttings or pieces of the roots. To have a succession of flowering plants all the year, some attention should be paid to the period of flowering of different sorts, which

a reference to Loudon's *Hortus Britannicus*, and also the period at which the cuttings are planted, will sufficiently indicate. The following routine we have been satisfied with following, viz., in August, at which period the earlier flowering kinds will have done flowering, the plants are cut down to within one or two eyes, if we may so speak; but which will be more intelligible if we say to within from an inch to half an inch of where the shoot sprung from. The shoots so taken off, are made into cuttings about six inches long, and cut close off below a joint, but the leaves should be left on, and not reduced in size, as is too often done. Each cutting is then planted in a pot of the size called large thumbs, and which are about two inches in diameter. They are then well watered, and plunged into a moderate hot-bed, kept close and well shaded, till they have begun to take root, when air is gradually admitted to them. The only care necessary during this part of their culture is to pick off all decayed leaves, to prevent the cuttings from rotting, to keep the temperature steady, but not too high, and above all to keep them shaded. In four or five weeks, cuttings so treated will require to be shifted into larger pots of the size known as thirty-twos, after which the plants may be placed in a cool, airy pit, or frame, but kept close to the glass to prevent their being drawn up weak and tall; or they may at once be arranged in the Geranium house. Plants so treated will flower in March if they are removed to the Geranium house before the setting in of severe frost.

In September, another set of cuttings should be put in, of the sorts that go out of flower at that period; these will flower in May, and a third set of cuttings should be put in, in January, which will flower from May to July; and a fourth and last set in March, which will produce plants that, if kept cool during summer, and brought into the Geranium house in September, will bloom during October, November, and part of December.

The tuberous-rooted sorts are much less generally cultivated now than formerly, their flowers bearing no comparison to those of the half-shrubby kinds. Such may, however, be readily increased by planting pieces of the roots in small pots, in a slight heat; leaving a small portion of the top of the root above ground.

On this subject, the following rational remarks are from the pen of Mr. Appleby, in a communication in the *Horticultural Cabinet*, Vol. V. p. 9.

"During the growing season, they require watering pretty freely; but as soon as they have done flowering, and their leaves begin to turn yellow, decrease the quantity of water gradually; the best method to do this, will be to water once in three days, then once a week, then once a fortnight, and lastly, once a month: by which time they will be completely at rest,

when no water must be given them till they begin to grow again, which may be looked for about February and March. When at rest, any situation where they can be kept moderately dry and cool, will do for them: heat, light, and moisture being unnecessary."

"The best time to increase this section of *Pelargoniums*, is just before they begin to grow. Take off a small tuber or two, where they can be spared, from each plant, and put them into as small pots as they can be placed, just to cover them; place them in gentle heat, giving but little water till they begin to grow, when they may be removed amongst the established plants, and the ordinary culture given; they may also be increased by seed, which, however, they do not produce so freely as the shrubby species."

In regard to the species that have not been hybridized, of which *P. bicolor*, *tricolor*, *ovatum*, *tetragonum*, *elatum*, *pendulum*, *fulgidum*, *elegans*, &c., form a part, the above authority directs as follows: "As they are all shrubby species, they require watering all the year, though always carefully, for if the soil gets soddened with water for any length of time, it is in general fatal to the plants. They also require greenhouse treatment during winter and spring. In summer they should be placed out of doors in an open situation, screened from high winds, and set upon a bed of ashes so thick as to prevent worms from getting into the pots: keep them clear of weeds, tied up neatly, and regularly watered during dry weather. Pot them into larger pots when they require it; the best season for which operation is the month of April.

"To propagate them, take youngish cuttings off about the month of May; fit some bell or small hand glasses to such a number of pots as may be required; fill them half full with broken potsherds, rough bits of turf, or anything that will permit the water to pass freely off; put in upon them as much of the compost," [loam, peat earth, vegetable soil, and sand, in equal proportions, which Mr. A. finds to be most proper for them,] "as will fill the pots up to one inch of the rims, and fill up to the top with pure sand; then give a gentle watering, and insert the cuttings, giving more water to settle the sand close and firm to them. When pretty dry, cover them with the glasses, and place them in a gentle heat; pot them off when struck, and keep them close and warm till they have struck root again; then give them the ordinary treatment, as to situation, air, watering, potting, and so forth."

Propagation of the large or ordinary sorts of *Pelargoniums* by seeds is seldom practised, excepting with a view to obtain new varieties; and it is almost vain to attempt this, unless attention has been paid to artificial im-



pregnation. Geranium seeds are best sown soon after they are ripe, provided that does not happen after August, in which case it would be better to delay sowing till February or March. When the seeds are sown, they should be placed in a mild hot-bed, and regularly shaded till they have vegetated; after which they should be accustomed to the sun and air to harden them previous to their being potted, which should be done when they are about an inch, or an inch and a half high; their treatment after this differs not from that of cuttings, only that they need not be topped with a view to form bushy plants, as it is not until they flower that their merits can be ascertained. Seedlings should however be stimulated, by being grown in very rich soil and occasionally watered with liquid manure.

#### GENERAL TREATMENT WHEN IN THE HOUSE.

By the latter end of September, the Geraniums, if they have been placed out during the summer, should be arranged in their winter habitation, along with such as have been recently propagated from cuttings. We would be understood here, however, as not advocating the practice of originating the whole collection of pelargoniums annually from cuttings, for we have found that most sorts flower well the second year, by following the simple routine of shaking the mould entirely away from such plants as have been cut down after flowering, re-potting them again in much smaller pots than those they flowered in, and placing them for a fortnight or three weeks in a close frame in which a slight bottom heat is maintained, until they begin to make fresh roots and break into young branches. After this they should be placed in a sheltered situation until the end of September, when they are removed into the Geranium house. During winter they should be supplied with air and water, and kept slowly growing until February, when they should be shifted into pots at least two sizes larger than those they have stood in during winter. From this time until they begin to come into flower, their growth should be encouraged by allowing them plenty of room on the shelves or stages, supplying them with an abundance of air and water, and turning them frequently round, so that all sides of the plants may enjoy an equal share of light and sun.

If kept too close, or too far from the glass, Geraniums are liable to grow up weak, and in that case seldom flower fine: they are also liable, in that case, to be attacked by the green-fly, which must be removed upon its first

appearance by the application of tobacco smoke from the fumigating bellows. They are not subject to any other diseases. We are aware that this is not the practice followed by the most eminent growers of this splendid tribe, but we recommend it to such as, from a variety of circumstances, have neither the convenience nor skill to bring on an annual supply.

The plants originated from cuttings planted in August, and treated as directed above, may, when potted into thirty-two sized pots, be placed in the Geranium house, or if they be kept in a cool, airy pit or frame, they need not be removed till the beginning of November : at all events, at whatever period they are brought in, it is essential that they be placed as near to the glass as possible, and abundantly supplied with air, and not set too closely together. All rambling shoots, and such as appear to grow too fast, should be pinched off, for the future habit of the plant depends on its treatment at this period. Most young plants have a tendency to send up one leading shoot, which often attains a considerable height before sending out lateral branches. A plant allowed to run so, can never afterwards be brought into a handsome form, and if the formation of the plant be not set about when young, it cannot be done afterwards without sacrificing the flowers, which lie in embryo in the points of the shoots that would in that case be cut off. One of the greatest faults in the ordinary mode of cultivating Geraniums is, allowing them to run up tall and naked at the bottom ; when such a course is followed, the plants will neither flower well nor look so handsome.

The greenhouse kinds of Geraniaceæ, though nearly all natives of the Cape of Good Hope, are much less hardy than the family of Erica from the same country ; this may be accounted for in various ways ;—soft-wooded or succulent plants are more liable to be injured by frost, than hard-wooded plants from the same latitudes, their exterior skin or outer bark being very thin, and their juices extremely abundant. Again, most of the family Erica are indigenous to the mountains, while most of the Geraniums are inhabitants of the plains, thus proving that altitude is as much to be studied in calculating the comparative degree of hardiness in plants, as latitude.

“We know,” says Mr. M’Nab, “from undoubted authority, that certain species of Cape Geraniaceæ, and certain species of Erica, grow together in the same kind of soil and in the same situation, intermixed one with the other in their native country ; but we know that in this country the same species of heaths will bear a degree of cold with impunity, which

will materially injure, and in many cases kill the *Pelargoniums* growing beside them.

“To grow Cape *Ericæ* and *Geraniaceæ* well together, would require far nicer management than I profess to be acquainted with. I know, however, that heaths will bear a degree of cold in the greenhouse in winter, (which, I am persuaded, is beneficial to their health), that will materially injure Cape *Geraniaceæ*. If therefore a particular point is to be found, to which the thermometer may be allowed to sink in the inside of a greenhouse during a severe frost, which will preserve the *Geraniaceæ* from injury, and not produce too much heat for the safety of the heath, it is one which I have never been able to ascertain.

“I am speaking however of these two families so as to have them in a high state of perfection. They may be both kept in the same house so as to make a tolerable appearance; but, I believe not in such a state of perfection as if they were in separate houses; for the fire heat which is absolutely necessary during severe frost for the one, is, as far as my observation goes, sure to be in some degree injurious to the other.”

Most of the true Cape species are much hardier than the English hybrids, for many of the former, particularly the tuberous-rooted kinds, stand in the open borders of this country during winter, while none of the latter, so far as we know, have ever been found to do so. The same degree of cold that would not injure the most tender *Erica*, would be fatal to the whole tribe of hybrid *Geraniums*.

During winter, frost must be excluded by covering the *Geranium* house with canvass, or by the application of artificial heat from the fire, either through smoke flues or hot water pipes, so as to keep the temperature from falling below thirty two degrees, but it should by no means be allowed to rise by the same means to forty degrees; a higher temperature during the day and by sun heat is quite a different thing.

On the general treatment of *Pelargoniums*, we find the following communication of Mr. Appleby, in Vol. V., p. 55 of *Horticultural Cabinet*, so replete with good sense and practical skill, that we cannot do better than give the quotation almost at length.

“The season to take *Geraniums* into the greenhouse depends upon the weather; and as all Cape plants are much healthier, and flower more freely the more they are exposed to the full air, so long as frosts keep off, I delay the taking them in: in fact, this last season, I did not house them generally until the middle of October. Choice kinds I have covered up with mats or large sheets of canvass, elevated on stakes, on such nights as are likely to be frosty.

“Perhaps no months in the whole year are so unhealthy for Geraniums as November and December, for the weather generally is dark, damp, and rainy, and the plants being full of sappy green leaves, and having received a check from new potting, are often shedding leaves, which I constantly remove, or they would become mouldy and give out a bad smell, offensive both to the owners and to the plants themselves.] At all times during the day I give as much air as possible, by opening the doors, windows, ventilators, &c. In the mornings I have a fire made to dry up damp, but allow it to go out before the house is shut up, for the remedy would be worse than the disease: close heat at this season being most injurious.

“During the severity of winter, fire is necessary to keep out the frost, (when very severe both day and night), but I am careful not to create damp by watering more than is absolutely necessary. It often happens on frosty days, that the sun shines clear and bright, and though the atmosphere is frosty, I always give air to lower the temperature of the house, to admit fresh, and to dry up damp.

“In January I scrape off the top soil of the pots, and have such as are green with moss well washed, picking all decayed leaves, trimming off any awkward branches on large plants, and tying up all that require it, and then having at hand some light rich soil, I fill up the pots, and finally give a good watering.

“As the season advances they will generally begin to show flower buds, and as soon as I observe this, I consider they require potting, especially those in the small pots struck in July; this will generally happen about the middle or end of March; but such as do not show flower, I do not re-pot, as that would encourage growth rather than flowering.

“In the spring months too much air cannot be given, and in consequence more water is required, which I bestow very liberally: frequently syringing over the whole plants, which refreshes them and prevents insects injuring them, though no kind of insects particularly affects the Geranium, if I except the green-fly, which is easily destroyed by tobacco smoke. When the flowering season is over, and I do not want the plants for the flower garden, I cut them down, and as the sap will flow out of the wounds, no water is given until the bleeding stops. If they are in too large pots, I shake them out, cut off part of the roots, and put them into less pots, which is a sort of renewal of the plants. I take them out of doors as soon as I think the frosts are over, to some place sheltered from the sun and west winds, setting them thinly upon a bed of coarse coal ashes two or three inches thick. During summer, I give water

when it is required, and keep them clear of weeds, and when I observe that they make roots through the holes at the bottom of the pots, I shift them into a fresh place, which is all the care they require until the autumn arrives, when they are sheltered from the frost in the greenhouse or in pits."

#### GENERAL TREATMENT WHEN OUT OF DOORS.

Geraniums should only be placed in the open air after they have done flowering. The situation most proper for them, is a dry, airy, exposed place; where they may enjoy the full influence of the sun. During the period of their remaining in this situation, they should be regularly supplied with water, and precaution taken to prevent worms from entering into the pots. The best preventive for this, is to water the ground between the pots now and then with lime water, or any water in which alkali has been dissolved.

The more common varieties, or such as there may be duplicates of, when done flowering in the Geranium house, will, if turned out of the pots and planted in the borders of the flower garden, flower again through the autumnal months, and may afterwards be either taken up, their branches cut down to within about an inch of the point they issued from, potted, and kept in a cold pit for next summer flowering. If not wanted for this purpose they may be thrown away.

#### SOIL.

The Geraniaceæ require a light rich soil to grow them to perfection; that composed of one half very rotten dung and rich light loam, will be found to answer every purpose. Young plants will grow rapidly in decayed leaves having a little sand mixed with them; but to bring plants to that perfection that will enable them to expand flowers of their full size, a little stronger soil is required. Some of the London nurserymen have grown excellent geraniums in a compost of night soil, street sweepings, &c., which has been sweetened, as it is termed, by being exposed to the weather for a year or two, and frequently turned over. To enrich any otherwise good light loam, bone dust, malt dust, yeast, or any similar stimulant may be used. Geraniums have been grown tolerably well, planted in moss, various species of *hypnum*, &c., but in

such a medium they require abundance of water. This latter method may be all well enough for plants intended to be brought into the drawing room to flower; but for the production of the best class of flowers a rich light loamy soil is required.

#### WATER.

During winter Geraniums must not be over-watered, as that would have a tendency to create damp, which would be extremely injurious to them, and should be guarded against by all possible means, such as free ventilation, occasional heat being thrown into the flues during the day, so that the superfluous moisture or damp may be allowed to pass off in the shape of steam, and above all, taking care not to spill water unnecessarily while applying it to the plants. During spring, while they are growing, and during the period of flowering, they can hardly have too much water, so that the pots are drained in a proper manner to allow of its passing through. It is not well, however, to place the pots in pans of water at any time, neither is it necessary to apply water over their tops with the engine at any period, particularly during winter.

#### SHIFTING OR POTTING.

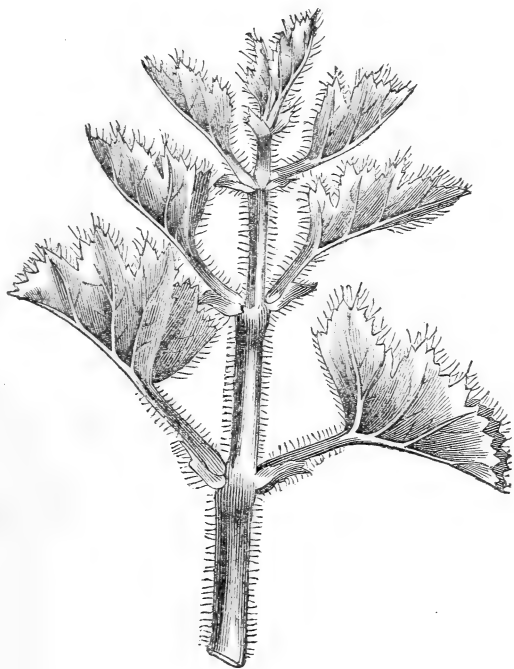
The season for potting Geraniums depends upon circumstances. Those that are propagated annually from cuttings, and intended to flower the same season, can have no stated period of shifting, as that entirely depends on the progress they make in rooting. For, to grow them in the first degree of excellence, they must be shifted into larger pots as soon as their roots have fully extended to the outside of the ball, and this process must be followed up till they have been placed in the pots in which they are to flower. At each removal they must be carefully taken from one pot to the other; the ball left unbroken, and the roots undisturbed, else the plants would sustain a considerable check.

Geraniums grown in the more ordinary manner are shifted, as has been already observed, soon after they are cut down after flowering, and placed in smaller pots in which they are to stand during the winter: again, in February or March they are to be re-potted into the sized pots in which they are to produce their flowers.

Draining and the routine of potting has already been sufficiently

noticed under the article *Erica*, and requires no separate remark here farther than to observe, that as *Geraniums* are, during their growing season, to be supplied with abundance of water, it is necessary that great precaution be taken in draining the pots well.

The following engraving represents the kind of cutting best adapted for forming a vigorous and handsome plant. It is taken off by passing the knife right through a joint, where the root fibres are always found: the cutting itself should contain five or six joints.



## SELECT LIST OF PELARGONIUMS.

## WHITE,

*With red or purple lines or spots.*

	s.	d.	s.	d.
Ada . . . . .	10	0	20	0
Alba multiflora . . . . .	5	0	—	0
Albion (L) . . . . .	7	6	—	0
Bella Donna (R) . . . . .	3	6	—	0
Bellissima (R) . . . . .	10	0	—	0
Brightoniensis . . . . .			1	6
Brightianum . . . . .			1	0
Cecilia . . . . .	5	0	—	0
Charles X. . . . .			1	6
Countess of Plymouth (D) . . . . .			2	6
Cupid . . . . .	5	0	—	0
Duchess of Clarence, new . . . . .			2	6
Duchess of Gloucester . . . . .			1	6
Fosterianum . . . . .			2	6
Hill's Champion . . . . .			2	6
Imogene (P) . . . . .			3	6
King of Whites . . . . .	3	6	—	0
Lucidum . . . . .	1	6	—	0
Margaretta . . . . .	2	6	—	0
Martineau (Miss) . . . . .	5	0	—	0
Mattocksianum . . . . .			2	6
Modestum . . . . .	5	0	—	0
Monsonia . . . . .	5	0	—	0
Mont Blanc . . . . .	3	6	—	0
Oxoniensis . . . . .			2	6
Pictum . . . . .	10	0	—	0
Princianum . . . . .	1	6	—	0
Queen of Whites . . . . .	2	6	—	0
Queen Bess . . . . .	7	0	—	0
Sylvia . . . . .	7	0	—	0

## BLUSH,

*With red or purple lines and spots.*

Albidum (D) . . . . .	1	6	—	6
Anna Maria (D) . . . . .			1	6
Amelia (D) . . . . .	3	6	—	0
Betsy (D) . . . . .	1	6	—	0
Captain Cook . . . . .			2	6
Diversum . . . . .	3	6	—	0
Habranthum . . . . .	2	6	—	0
Lady Anne Bingham (D) . . . . .			1	6
Maid of Athens (F) . . . . .			15	0

## LILAC.

*Different shades.*

	s.	d.	s.	d.
Amesbury (R) . . . . .	1	6	—	6
Don Quixote (D) . . . . .	3	6	—	0
Inscriptum grandiflorum . . . . .	2	6	—	0
Lauretta (D) . . . . .	3	6	—	0
Obovatum (D) . . . . .	1	0	—	0

## PINK,

*With red or purple lines or spots.*

Adansoni (D) . . . . .	2	6	—	0
Ann of Cleves . . . . .	2	6	—	0
Britannia (S) . . . . .	2	6	—	0
Diadimatum . . . . .			1	6
Helen Mar . . . . .			2	6
Incarnation superb, beautiful . . . . .			40	0
Lavinia . . . . .			2	6
Lovely Anne . . . . .	10	0	—	0
Maid of Athens . . . . .	2	6	—	0
Miss Annesley . . . . .	5	0	—	0
Optimus . . . . .	5	0	—	0
Sweetianum Germanicum . . . . .	5	0	—	0

## ROSE.

*Dark purple lines or spots.*

Abietinum . . . . .	2	6	—	0
Adelinæ . . . . .	5	0	—	0
Amabile superb . . . . .	2	6	—	0
Angelina . . . . .	2	6	—	0
Diomedé (H) . . . . .	3	6	—	0
Don Juan . . . . .	5	0	—	0
Don Roderick . . . . .			20	0
Dulcinea, new (D) . . . . .	5	0	—	0
Duchess of Sutherland . . . . .			3	6
Emily . . . . .			2	6
Flora M'Donald (C) . . . . .			1	6
Flower Ball (D) . . . . .	2	6	—	0
Francesca . . . . .	10	0	—	0
Gazelle . . . . .	3	6	—	0



	s.	d.	s.	d.
Gem . . . . .	7	6—15	0	
Imperatum maximum . . . . .	2	6—5	0	
Insuperabile . . . . .	10	0—20	0	
Incaratus (G) . . . . .		2	6	
Jack of Newbury (S) . . . . .	1	6—2	6	
Julius Cæsar . . . . .	2	6—5	0	
Magniflorum (S) . . . . .		2	6	
Megalanthum . . . . .		1	0	
Midas . . . . .	3	6—5	0	
Norbiton Hero . . . . .	3	6—5	0	
Paniculatum (D) . . . . .	2	6—5	0	
Peelii . . . . .	1	6—2	6	
Phoenix (R) . . . . .	1	6—2	6	
Pixey Queen . . . . .	10	0—20	0	
Pulcherrimum (G) . . . . .	2	6—5	0	
Queen of Roses (D) . . . . .		1	6	
Robin Hood . . . . .	5	0—10	0	
Regium novum . . . . .		2	6	
Rembrandt . . . . .	10	0—20	0	
Rosinante . . . . .	3	6—10	0	
Rosette . . . . .	5	0—10	0	
Rhododendron, flowered . . . . .	2	6—5	0	
Rousianum . . . . .	5	0—10	0	
Rosomond . . . . .	2	6—5	0	
Rosalie . . . . .	2	6—5	0	
Rosa (H) . . . . .	2	6—5	0	
Rosa Mundi (D) . . . . .	3	6—10	0	
Sancho Panza . . . . .	3	6—10	0	
Sir John Broughton (G) . . . . .	5	0—10	0	
Sophia . . . . .	2	6—5	0	
Sphinx . . . . .	3	6—5	0	
Statura . . . . .	2	6—5	0	
Tam O'Shanter, fine eye . . . . .	10	0—20	0	
Timandra . . . . .		2	6	
Thumbergianum . . . . .	3	6—7	0	
Virginus (C) . . . . .	1	6—2	6	
Vulneratum . . . . .	2	6—5	0	
Wheelerii . . . . .	5	0—10	0	

## VERY BRIGHT ORANGE.

*Large black or velvety spot.*

Aladdin . . . . .	5	0—10	0
Astartæ . . . . .		20	0
Dennis' Queen Adelaide . . . . .	2	6—3	6
Prince of Orange . . . . .	3	6—10	0
Queen of Sheba . . . . .	2	6—5	0

## RED OR SCARLET.

*Shaded with bright orange, dark purple lines or spots.*

Filigree . . . . .	5	0—10	0
Gainsianum (G) . . . . .	1	0—3	6
Lord Brougham . . . . .		1	6
Linea . . . . .	3	6—5	0
Ne Plus Ultra (D) . . . . .	1	6—3	6
Perfectum (R) . . . . .		2	6

	s.	d.	s.	d.
Quadriflorum . . . . .			2	6
Red Rover . . . . .			1	6
Willmoreanum . . . . .			2	6

## OAK LEAVED, RED OR SCARLET.

*Dark lines or spots.*

Nutans . . . . .	1	6—3	0
Quercifolium superbum . . . . .	1	6—2	6
Othello . . . . .		2	6
Eminent . . . . .		1	6
Fire King . . . . .		1	6

## BRIGHT SCARLET.

*Shaded with light or dark crimson; very dark or black spots or lines.*

Adonis . . . . .		2	6
Bellianum, or Mackie's Seedling . . . . .	2	6—5	0
Brilliant . . . . .		1	6
Chasse . . . . .	3	6—7	0
Flexuosum . . . . .		2	6
Isedorianum . . . . .	7	0—10	0
King of Scarlets . . . . .	5	0—10	0
Lucifer . . . . .	3	6—7	0
Memnon . . . . .	5	0—10	0
Meteor (R) . . . . .	2	6—5	0
Nimrod (R) . . . . .	2	6—5	0
Perdita . . . . .	7	6—15	0
Phœbus . . . . .	3	6—7	0
Rouge et Noir . . . . .	10	0—20	0
Wellington . . . . .	10	0—20	0

## VERY FINE LARGE RED,

*With black lines or spots.*

Admiral Nelson (S) . . . . .		2	6
Admiral Napier (C) . . . . .		2	6
Amandum . . . . .		2	6
Atalanta . . . . .	10	0—20	0
Bancho . . . . .	3	6—7	0
Banksianum grandiflorum . . . . .	5	0—10	0
Brassicoides . . . . .	5	0—10	0
Bonaparte . . . . .	5	0—10	0
Clarissianum (D) . . . . .		1	6
Concessum . . . . .	3	6—5	0
Dictator . . . . .	10	0—20	0
Elegans (F) . . . . .	2	6—5	0
Emperor of the West . . . . .	20	0—40	0
Flagrans (D) . . . . .		1	0
General Moore . . . . .	2	6—5	0
Hector . . . . .	3	6—10	0
Henry VIII. (D) . . . . .	3	6—7	0
Hercules superb . . . . .		40	0

	s.	d.	s.	d.
Honorable . . . . .	2	6—	5	0
Imperatum perfectum . . . . .	2	6—	5	0
Man of Ross . . . . .			1	6
Mary Stuart . . . . .	1	6—	2	6
Mirabile major . . . . .	2	6—	5	0
Miller's Victory . . . . .			1	6
Oscar . . . . .	15	0—	20	0
Paragon, Beautiful . . . . .	40	0—	60	0
Parker's Triumph . . . . .	10	0—	20	0
PERFECTION (D) . . . . .	5	0—	20	0
Queen of Scots (M) . . . . .			1	6
Rubra compacta . . . . .	3	6—	7	0
Sesostris (P) . . . . .	2	6—	5	0
Zohrab . . . . .	2	0—	3	6

## PURPLE.

*Dark lines or spots.*

Albion (C) . . . . .	2	6
Capitatum superb . . . . .	20	0
Colleyanum . . . . .	1	6
Fusco superb . . . . .	1	6
Lydia . . . . .	10	0—20 0
Veitchianum . . . . .	1	6

## LARGE CRIMSON.

*Very dark shades.*

Belvidere (J) . . . . .	2	6—	5	0
Black Rover . . . . .			20	0
Cicero . . . . .	5	0—	10	0
Elvira (H) . . . . .	3	6—	7	0
Lord Denman . . . . .	2	6—	5	0
Maria Louisa . . . . .	1	6—	2	6
Superbissimum . . . . .			1	6
Succulentum . . . . .			1	6

## CRIMSON PURPLE,

*With white, scarlet, or black marks or lines.*

Black Prince (G) . . . . .	1	6
Catesbianum . . . . .	3	6—10 0
Cæcium . . . . .	5	0—10 0
Calamistratum (D) . . . . .		1 0
Conspicuum (D) . . . . .		2 6
Descendens . . . . .		3 6
Don Juan (J) . . . . .	10	0—20 0
Euterpe . . . . .	10	0—20 0
General Washington . . . . .	5	0—10 0
Humei grandiflora (D) . . . . .	3	6—5 0
Heriartianum . . . . .	3	6—7 0

	s.	d.	s.	d.
La Blache . . . . .	20	0—	40	0
Miranda . . . . .	5	0—	10	0
Purpurea cœrulea . . . . .	3	6—	7	0
Smith's Queen Adelaide . . . . .			2	6
Weltjanium (W) . . . . .			1	6

## CLOUDED OR OBSCURED,

*With dark purple or black.*

African . . . . .	3	6—	5	0
Brunette . . . . .	1	6—	2	6
Champion of Devon . . . . .	2	6—	5	0
Curate . . . . .			3	6
Eldonia . . . . .			2	6
Exquisite (K) . . . . .			3	6
Heroine . . . . .			2	6
Jenkinsonii superb (D) . . . . .			2	6
Lord Ebrington (D) . . . . .			2	6
Obscurum grandiflorum . . . . .			2	0
Pullum . . . . .	3	6—	10	0
Yeatmanianum grandiflorum (D) . . . . .	2	6—	3	6

*Upper petals nearly approaching to black, with paler lower petals.*

King's Psyche . . . . .	3	6—	7	6
Marginatum . . . . .	1	6—	2	0
Olympicum . . . . .	2	6—	5	0
Pallaceum . . . . .	5	0—	10	0
Smut . . . . .			2	6

*Bright rose red.*

Glaucoxis . . . . .			2	6
Lady Denbigh . . . . .	5	0—	15	0
Lord Munster (R) . . . . .			2	6
Poiteanum . . . . .			2	6
Roselaide . . . . .			2	0

*Dark rose red.*

Hero (R) . . . . .			2	6
Kermesinum . . . . .			2	6
Lord Hill (fine) . . . . .	5	0—	15	0
Media . . . . .	2	6—	5	0
Penneyanum . . . . .			2	6
Van Huysen (A) . . . . .	2	6—	3	6

*Dark and purple, shaded red.*

	s.	d.	s.	d.
Augustissimum superbum	3	6—	7	0
Fulminans	.	.	1	6
Grandissima	.	.	1	6
Pavoninum maximum	3	6—	7	0
Proteanum	2	0—	5	0
Serviciæ	2	6—	3	0

## VARIOUS.

	s.	d.	s.	d.
Bipinnatifidum	3	6—	5	0
Echinatum	.	.	2	6
Maculatum sanguineum	.	.	5	0
Quinquevulnerum	.	.	2	6
Sanguineum	.	.	2	6
Schizopetalum	.	.	5	0
Speculum Mundi	5	0—	10	0
Vænulum sanguineum	2	6—	5	0
Vespertinum	.	.	2	6

*To these may be added the following, varying in price from 1s. to 1s. 6d. They generally continue in flower from April to September, and vary in height from one to five feet.*

Affine, orange rose  
 Albiflora, white  
 Albinotatum or Favourite Purple, purple  
 Angelina, white and dark spots  
 Ardens major, deep scarlet  
 Ascyrum, light rose  
 Atorubens, purple  
 Augustum, pale pink and spot  
 Bagshot Park Seedlings, red and blush  
 Bethelina, pink and rose  
 Bicolor, purple crimson  
 Bishoppæ, deep scarlet  
 Boyleæ or Countess of Cork, white striped  
 Broughtonæ, orange scarlet  
 Brown's Princess Augusta, rose purple  
 Chrysanthemifolia, deep pink  
 Citriodorum, white and spots  
 Cleopatra superba, white striped  
 Commander-in-Chief, blush and spots  
 Concolor, purplish pink  
 Concolor major, purple rose  
 Coronata, purple  
 Coronation, white and stripes  
 Corruscans, purple striped  
 Coutsiæ, light rose  
 Cupid, pink and blush  
 Daveyanum, dark crimson  
 Decorum, orange red and spots  
 Defiance, light scarlet  
 Dependens, white blotched  
 Diversilobum, light rose  
 Duchess of Kent, lilac pencilled  
 Duchess of St. Alban's, white & stripes  
 Echinatum, white and spots  
 Eximium or Catherine Stuart, blush  
 Fairlieæ, lilac and white  
 Feronia, deep rose and crimson  
 Flammula, rose and pink  
 Flexuosum, deep scarlet  
 Floccosum, purplish pink

Foliacea, orange scarlet  
 Foliacea major, orange scarlet  
 Foliosum, purple  
 Formosum, white and stripes  
 Fusciflorum, purple  
 General Riego, dark rose  
 Georgiana, pale pink  
 Glaucum, white  
 Grandidentatum, white and purple stripes  
 Grandiflorum, white and stripes  
 Grandiflorum minor, white and spots  
 Grandiflorum purpurea, purple lilac  
 Graveolens or Rose Scented, lilac  
 Graveolens, Striped Leaved, lilac  
 Hammerslæi, light rose  
 Helen, blush and crimson spots  
 Heselrigii or Lord Cochrane, dark purple  
 Hibiscifolium, light rose  
 Humei, dark rose purple  
 Husseyanum, pink lilac  
 Ignescens, scarlet  
 Ignescens major, scarlet and spot  
 Incurvum, orange scarlet  
 Ingram's Princess Royal, dark purple  
 Involucratum, white and stripes  
 Jenkinsoni, white and dark spots  
 Lady Essex, pink and stripes  
 Lady Rowden, pink striped  
 Lady Stamford, pale pink and spots  
 Lanceolatum, white and spots  
 Lanfordiæ, white striped  
 Latifolium, rose  
 Latilobum, scarlet and stripes  
 Leopold, pale pink lilac  
 Lord Combermere, purplish rose  
 Lord Lyndoch, fine rose  
 Macranthos, white and stripes  
 Majestum, purple  
 Marshall's Duke of York, lilac striped  
 Marshall's Oldenburgh, blush striped

Matilda, rose and pink  
 Mattocksianum, white and spots  
 Megáleion or De Vere, rose  
 Memnon, rose  
 Moreanum or More's Victory, deep  
 scarlet  
 Mucronatum, pink and stripes  
 Murreyanum, light purple  
 Nairnii or Anne Boleyn, pink and rose  
 Oblatum or Emily, pale pink  
 Obscurum, white and dark spots  
 Optabile, white and stripes  
 Palkii, purple crimson  
 Pansiana, lilac and purple  
 Pavoninum, pink and spots  
 Planifolium, light rose  
 Potteri superba, orange scarlet  
 Prince of Orange, blush and spots  
 Princess Charlotte, rose purple  
 Pulcherrimum, light purple

Quinquevulnerum, deep purple  
 Ramigerum or Paul Pry, rose striped  
 Rhodanthum, deep pink  
 Rowena, lilac  
 Royal Purple, dark rose purple  
 Rubescens or Lady Liverpool, pale  
 pink  
 Rugosum, purple  
 Scarboroughia, white striped  
 Scutatum C., white and stripes  
 Seymourei, purple  
 Shakspeare, deep rose and pink  
 Sir Walter Scott, pale pink  
 Smithii, light rose and pink  
 Spectabile, light rose  
 Spectabile azureum, purplish pink  
 Spectabile maculatum, light spotted  
 Spectabile purpureum, purplish rose  
 Spectabile striatum, light striped  
 Spectabile villosum, light rose

## THE CAMELLIA HOUSE.

THE Camellia House, which, besides this splendid genus of flowering plants, might contain the magnificent Nepal Rhododendrons, the best varieties of tender English hybrids, as well as the Chinese Magnolias, whose rich perfume would amply make up for the absence of fragrance in the two former genera, as well as some other plants of kindred habits. Of the genus Camellia, there are in this country at present, six species, and above two hundred varieties; and the collections of these plants on the continent are still more extensive. We have seen in one collection alone, that of M. Makoy, of Liege, in Belgium, above two hundred and twenty varieties of greater or less merit; and in the collection of M. Parmentier, of Enghien, in the same country, no less than four hundred varieties. There appears to be at present quite a mania on the continent for increasing the number of varieties of this plant, and in this, as in most similar cases, many varieties scarcely differ from each other, certainly not so much as to induce us to recommend above one third of the number for general purposes.

Few plants are more easily cultivated than the Camellia, particularly when they are grown in a house by themselves; and few plants are so universally admired. Many persons are, we believe, deterred from cultivating Camellias from an erroneous supposition that they require the accommodation of a conservatory or greenhouse, and cannot be grown without;—than this, nothing is more absurd, for not only can Camellias be cultivated in great perfection in pits or frames, protected merely by the glass lights; and occasionally, in the most severe weather, by a mat thrown over them; but they are also found to thrive exceedingly well when planted out in a warm and well-sheltered border, or shrubbery; without any protection whatever excepting a little dry fern, moss, or litter, laid over the ground in which they are planted. Certainly, to have Camellias in the first degree of excellence they should be kept in a glass house, but that they will flower and grow well in the open air, in favourable situations, is also certain; and the day may not be far distant when the Camellia will be found as much the ornament of our shrubberies as the *Pyrus japonica*, *Corchorus japonica*, *Ancuba japonica*, and other plants from the same country, and which were all within our recollection, treated

as greenhouse plants, although experience has long ago taught us that they are as hardy as any plant in our shrubberies.

Of the plants possessing sufficient beauty or fragrance to be admitted into this description of house along with the Camellia, we may mention, *Nerium Oleander*, and its splendid varieties, *Illicium floridanum*, *Daphne odora*, *Luculia gratissima*, *Magnolia fuscata*, &c. And as scandent plants, to be trained up under the rafters of the roof, we would recommend *Kennedya*, various species, *Wistaria chinensis*, *Caprifolium japonicum*, *Tecoma grandiflora*, *Passiflora Loudonii et kermesina*, *Jasminum grandiflorum*, &c. A house so furnished, would be sufficiently interesting throughout the year, and never without blossom, or the most delightful fragrance. Such a house, perhaps, does not exist; but we cannot surely be accused of extravagance in anticipating such an event, when we consider the rapid strides that the principles of order and taste are making amongst the followers of Flora; and when these principles are understood along with the practice of Floriculture, we shall see houses arranged according to the rules laid down in the foregoing pages.

#### STRUCTURES CALCULATED FOR THE GROWTH OF CAMELLIAS.

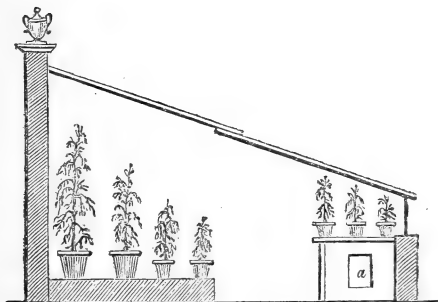
THE varieties of Camellia, of which there are many, are found indigenous in the tea districts of China and Japan, in a temperature by no means high, and sometimes falling even below the freezing point. The varieties originated in this country, of which there are many, are equally hardy; and in many situations they have been found to thrive exceedingly well when planted in the open borders. The plants which agree with them in culture, and enumerated previously as being proper inmates of the same house, are equally hardy, and have also been found to resist the cold of our ordinary winters, when planted in favourable situations. Protection merely from intense frosts, is all that is required artificially, to preserve these plants; but to have them flower at an early period of the season, which appears to accord with their natural period of blooming, it is necessary that they be placed under the protection of a glass house.

The situation and aspect which will suit the Camellia and its allies, may be of a description which would by no means suit the section last treated of. There is no doubt but that these plants will thrive in houses having a southern exposure, but that they will also succeed in those having an opposite exposure, is sufficiently demonstrated in practice. A Camellia house, therefore, may be erected without especial regard to that particular. It

is, however, at the same time necessary, that the situation be not shaded by buildings or high trees, nor placed in too low and damp a situation.

The accompanying diagrams will explain what we consider to be the best form of houses adapted for this section of plants, that is to say, if such are to be built expressly for the purpose. The first may be erected against the north wall either of a dwelling house or greenhouse already existing. In such case, a communication should be made between them, either at the centre, or at both ends: by this means, the party wall will serve for two houses. If the erection be against the dwelling house it will be convenient to have a door of communication, to admit of access in wet weather, and for the greater convenience of the owner at all seasons. The Camellia house may, with great propriety, be placed behind the Heath house, all other circumstances being favourable. An arrangement of this sort will save space and expense, while it must be admitted to be the most convenient in many other respects.

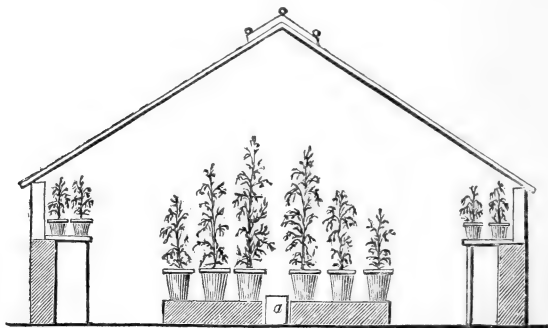
A glance at the annexed figure will explain that the platform in front, over the flue, is intended for small plants, while the platform behind, which should be raised to the height of about from six to twelve inches, is intended for the larger specimens. Camellias, Rhododendrons, &c., unlike most other greenhouse exotics, increase in value as they increase in size, therefore plenty of room should be allowed them in the house, so that all sides of the plants may present a perfect outline.



The next view represents a span-roofed house, a species of greenhouse to which we are partial, as it admits of more light and space, with less brickwork, and is, upon the whole, more economical in the erection than most other

forms of equal convenience and capacity. The raised platform which occupies the middle of the house, and is about six inches or a foot above the level of the floor, is intended for the plants to stand on, in the order in which they are represented in the annexed sketch. The flue at *a*, which passes along the centre of the said platform, is placed there for precaution only, as, if the roof be covered as recommended in the case of the Heathery, no frost will reach the plants to injure them. We may here remark that much more harm is done to all greenhouse exotics by the application of too much fire heat, than by the opposite extreme. A narrow shelf runs round the house, on which the smallest plants are to be set.

In regard to the height of a Camellia house, that must be determined by the size of the plants intended to be cultivated; and as it cannot be conveniently altered after the first erection, it will be better to elevate the platform to a sufficient height to suit the plants while they are small, and to lower it progressively as they advance in height.



#### PROPAGATION AND TREATMENT WHEN YOUNG.

The Camellia is propagated by cuttings, seeds, budding, grafting, inarching, and sometimes by laying. The single red variety is propagated by cuttings, layers, and seeds; the two former, for stocks on which to bud or inarch the better kinds, and by seeds, with a view to procure new varieties.

In propagating by cuttings, the month of August has been found to be



the proper season, and the shoots selected for this purpose should be well ripened, and of the preceding summer's growth ; younger shoots than these are apt to damp off, and older ones require a much longer period to form roots, and often fail to do so entirely. The best situation for them is a cold frame, merely covered with the lights and shaded from the sun, excluding the air as much as possible until they have begun to make roots, when it should be admitted to them gradually until they can stand both the full force of the sun and air without flagging. Upon a large scale, the cuttings may be set in the bed, in a preparation made for them of half peat and half light loam, dibbled in pretty thickly, and the mould made firm round their stems. And upon a smaller scale, they may be planted in pots, or deep pans, properly drained, and filled with the same mould as above.

Towards the following March or April, they will be forming roots, which will be indicated by their making young shoots ; at this period their growth will be very much forwarded if they be placed in a gentle heat and kept pretty moist ; the atmosphere of a common cucumber bed, but with considerably less heat, will suit them well. There will be no difficulty in removing such as are in pots, but those that are planted in the mould in the pit, must be taken carefully up, potted, and placed in their proper situation. By the middle of summer the most forward will be in a fit state for potting into single pots, and the more tardy by October or November.

The most usual method of propagating by cuttings is to select them from plants of the single red variety, which is thought to strike sooner, and with greater certainty than the double varieties. Some cultivators, however, maintain a different opinion, and assert that double sorts may be raised by cuttings as successfully as the single ones, and also that plants originated from double sorts make as good and as lasting specimens as those originated from the single ones, a circumstance we see no reason to doubt, although such is not generally acknowledged.

The following routine has been found very successful in striking double-flowered Camellias from cuttings. Cuttings of the previous year's growth are selected in March, and cut off exactly at the junction of the wood with that which is a year older. The soil used is sandy peat, and the cuttings are placed round and close to the edges of the pots. Bell glasses are placed over them, and the pots are plunged about half their depth in a *mild* bottom heat. They are kept in this state until they have pushed and completed their first growth, when they are removed to a vinery, or similar temperature during the winter. The young cuttings are

planted off into small pots about the end of January, or the beginning of February, after which they are placed in a temperature of from sixty five to seventy degrees till about the beginning of June, when they are fit for removal into the Camellia house or greenhouse.

#### PROPAGATION BY SEEDS.

Seeds should be sown as soon as they are fully ripe, or imported, in pots filled with peat and loam, and placed in a cool pit, from which frost is excluded. They require about two years to come up, after which they should be treated exactly as cuttings.

Seeds of the Camellia are sometimes imported from China and Japan ; these require a long period to germinate, and some of them, like many other similar seeds from India, frequently lose their vegetative properties entirely, before they arrive in this country. It has been suggested, that if seeds so situated were immersed in oxalic acid, or folded up in a cloth moistened with that acid, germination would be accelerated ; but they should not remain longer in the acid than the moment germination has commenced, when they should be sown in pots in mould prepared for them.

An anonymous contributor to the Horticultural Cabinet observes, " I have paid some attention to raising seedlings, and have been most amply repaid by some very handsome and peculiarly striking varieties. My practice is to study which admixture of two sorts are likely to produce the most striking distinct colours, and to impregnate accordingly. I apply the farina by means of a camel hair pencil, and for a fortnight afterwards do not allow any water to fall upon the flowers. I have uniformly found my seedlings to take the habit of growth of the parent sort each individual plant partook most of in colour, whether of the male or female.

" I usually force the Camellias under my charge, so that they bloom from September till April, thus having opportunity of impregnating early in spring, which I generally do in February, or March ; by this means I get the seeds well ripened. When the seed is ripe, I retain it in its capsul till the following February, when I sow it in small pots filled with light sandy loam, and place it in moist heat. When the plants are a few inches high, I pot them singly into small pots, being careful to have them well drained with broken potsherds. After keeping the plants in

the moist heat for a fortnight, I remove them into a vinery, and gradually inure them unto the green house temperature."

Plants so originated are sometimes permitted to grow on till they flower, when, if the variety be considered not of sufficient merit to be kept as such, they may then be used as stocks on which to bud or inarch the other good kinds. Camellia stocks can never be too large; for if they were even several feet high and furnished with several branches, each of these could be operated upon, and consequently a large plant would be produced in a short time.

It is rarely that any shade of difference follows plants originated from seeds, unless artificial fecundation has been strictly attended to.

#### PROPAGATION BY GRAFTING,

Is very frequently adopted, particularly when the sorts intended to be increased do not already exist in the same collection. This process is best accomplished when done in spring, about the period when the plants begin to grow. The kind of grafting most generally practiced is side-grafting, which is one of the most common in use, and therefore requires no elucidation, further, than as the stocks are often weak, clay should not be used, as the quantity necessary would be too weighty for the stock to carry. A little fine moss, kept rather damp, will be a good substitute, and the grafting wax of the French may be here used to advantage. It tends considerably to insure success in this process, if the end of the graft or scion be left a few inches longer than where the union is intended to take place, so that its end may be immersed in a phial of water, or stuck into a small potatoe, or turnip. From either of these sources the graft will derive nourishment until it is supplied from the stock.

Side grafting is so called from being performed on the side of the stock, and differs little from whip, or tongue grafting, which latter is that in general use in nurseries upon plants generally. In side grafting, the bark and a little of the wood of the stock is taken off in a slanting direction, the lower end of the scion is also cut, so as to fit the part as nearly as possible, they are then brought together, tied fast with bass, and clayed, or mossed over.

Camellias, like most other woody plants, may be also propagated by several other modes of grafting, of which about seven or eight varieties are practised in this country. The French have carried this matter much farther, for we find the late Professor Thouin has described about forty

different modes, and about fifty different modes of budding. In the earlier ages of horticulture, the art of grafting was considered little short of magic, it is, however, now well understood, and may be practised by the curious as an amusement. Those who wish to study the philosophy of this art, may consult with advantage the works of Thouin, Du Hamel, Rosier, and Quintiney, amongst the French: Sickler, Christ, and Mayer, amongst the Germans; and Philip Miller, Curtis, Knight, and others amongst the English.

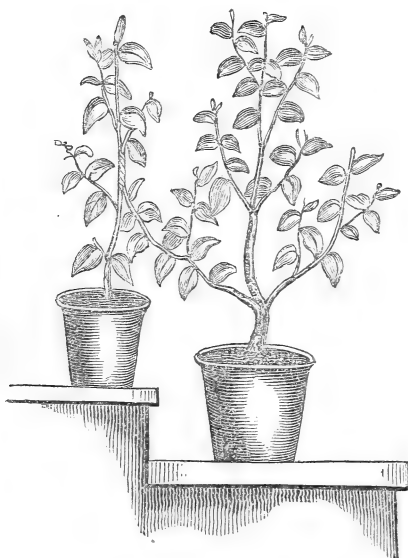
#### PROPAGATING BY BUDDING,

Is very much practised of late years, particularly in regard to new or very rare varieties, for by this means a shoot of seven buds, for example, if grafted or inarched would produce one, or at most two plants, while if the budding system be followed, as many plants as there are buds will be the produce. To such an extent is this mode of propagation carried on amongst continental cultivators, that they fix the price of their plants by the number of leaves or buds that they contain. Budding may be performed at almost any period of the summer, the plants operated on being kept in a moist and rather warm propagating house. In the case of budding and also of grafting; if the stocks be small and the operation performed near the bottom of the plant, they will be much benefitted by being placed under hand glasses until the union takes place, and indeed until the bud, or scion, has grown for a few inches, and not till then can the heads of the stock be cut off, without a risk of failure, because, as it has been justly remarked by a writer upon this subject in the Hort. Register, an exuberance of sap is thus thrown into the scions before they are sufficiently established to receive it without injury; just as too great a supply of nutriment injures the infant of the human race; neither should the ligatures and clay be removed before that time; these remarks are also applicable to the young inarched plants. After this, all the plants should have their tops nipped off to two or three buds, or they may be removed by inarching or grafting them, if it be wished to increase the stock of the variety; but unless one of these precautions be followed, the plants will very probably run up with a single stem, and instead of being bushy and pyramidal, will be loose and rambling, and must eventually be cut down. When the plants are headed down they should be kept in a gentle hot bed, or moderately close frame, and should they show a disposition to

grow straggling or weak, the shoots should be from time to time shortened.

#### PROPAGATING BY INARCHING,

Is the most common and also the most expeditious and certain mode of any, and is performed in general in spring, when the plants are beginning to grow. The essential difference between this mode and that of grafting, as noticed above, is only in placing the plants, as represented below, so that neither the one nor the other is displaced until the union has fully taken place, when they may be separated and treated like plants that have been grafted.

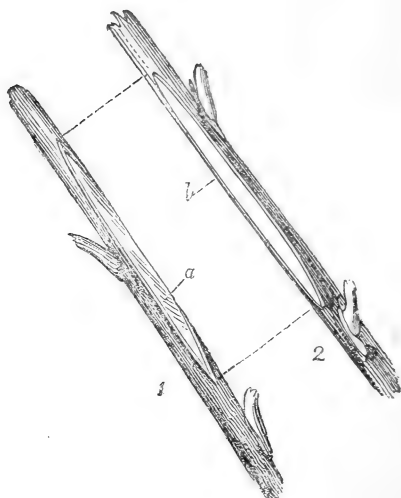


Inarching may be performed during the summer and autumn, after the ripening of the wood, or early in spring before the plants begin to grow. It is not necessary to use clay in operating by this method, a little damp soft moss slightly tied round the part where the union is to take place is

quite sufficient. In general, the union will have taken place and the scions may be cut from the parents in about two months.

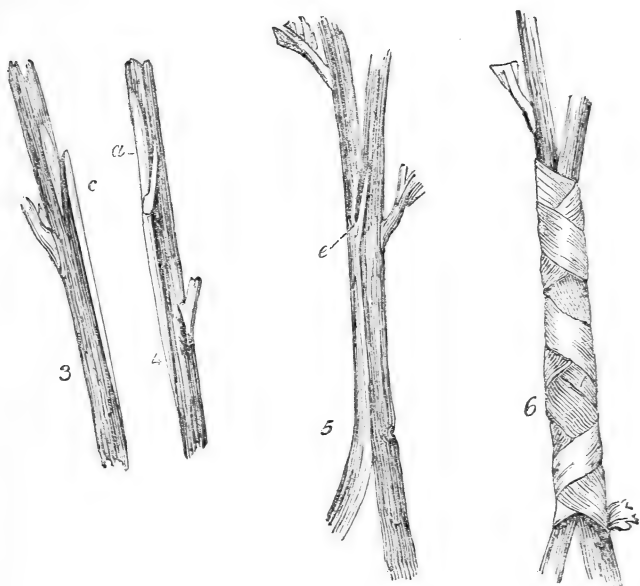
But the accompanying engravings and their description will convey to the reader a better idea of the process of inarching than any description we could give.

Supposing then, that the plants to be inarched are in a fit condition for the work, choose a new clean portion of the stem of the stock, as near the scion as possible, then take a clear portion of the stem of the stock as near the size of the scion as you can, then take a *slice* of the bark with a small piece of the wood off, about the length of one inch and three quarters, as at *a*, fig. 1. Bring the scion close, and take the exact length



of the naked part of the stock *a*, and make a similar place bare in the scion, as at *b*, fig. 2. When this is done, cut a tongue in the *stock*, or a wedge-slope gap, as at *c*, fig. 3, to receive the tongue *d*, fig. 4; by this means the scion may be hooked on to the stock to insure firmness, as shown at *e*, fig. 5. When they have been thus brought together, care

must be taken that the two barks meet exactly down one side. They may be easily so placed when hooked together; and then the best way is, to



secure the top by tying it round firmly with damp bass; and after this very little care will insure the bark of the stock and scion meeting at their edges down one side. On the proper junction of these parts of course all depends, and as soon as they are so fixed, bind them together firmly with a smooth piece of new matting as at fig. 6. A small piece of clay may be placed over the bandage to exclude the air, and over this a little damp moss may be applied to keep the clay from cracking. If the plants are in a good growing state, in six weeks or two months the union will be so perfect as to admit of the scion being separated from the parent plant. After this, the plant had better be allowed to remain a short time,—say eight or ten days; and if then the plant continues to look in health, the bandage may be entirely removed, and the part re-bound with a broader piece of matting, to prevent it from swelling out and becoming unsightly. Over it a little damp moss may with advantage be placed; the whole

band may, from time to time, be loosened, and entirely removed as soon as the scion appears quite established.

#### PROPAGATING BY LAYING,

Is seldom practised unless by nurserymen upon an extensive scale, and who have Camellia stools planted out in pits, protected during winter by glass, mats, or other covering. The process of laying is performed in spring, and is the same as that practised with other evergreens. The year following, the young plants are taken off the stool, potted, and afterwards used as stocks.

#### GENERAL TREATMENT WHEN IN THE HOUSE.

In a Camellia house having a north aspect, was it not that the plants would in most cases stand too crowded during the summer, we would prefer to keep them always in; but in houses having a southern aspect, we would remove them out into the open air during the heat of summer into a cool shaded situation, for Camellias do not like an excess of heat, whether from the sun or from artificial means. The only season when a slight heat is advantageously applied is, when they are making their young wood, at which period also they require an extra supply of water, not only at their roots, but over their foliage also. To prolong the flowering season of this splendid family, it might be well to remove a few of them in succession into a vinery, or cool stove, to forward their blooming, but this must be done at the period when they are making their wood, or rather before that period naturally arrives, say March, or even the end of February; the intention being to forward the formation of wood, and consequently flower buds also. When the flower buds are formed, they should then be placed in the coolest part of the Camellia house, and less abundantly supplied with water. If three or four sections of plants be so treated, they will come into bloom in the same order, and keep up a considerable display until the general collection come into bloom at their natural season.

The Camellia is easily cultivated, the few following rules being attended to viz., never allow them to become too dry at the root, which they are liable to do, particularly if under potted. An extreme of moisture is also to be guarded against. Keep them cool while they are coming into bloom,



and during the period when they are so. Keep them rather close, slightly warm, and very moist while making their wood. Give them plenty of pot room, particularly large specimens, but under no circumstances plant them out in the borders of the house. Shade them from the sun, and never apply heat to them when coming into flower, nor during the period of flowering, for the buds will neither expand so well, nor will they continue so long in perfection.

After the flower buds are formed, great care ought to be taken that the plants are not neglected from want of water, even for the shortest time, as if such should be permitted, the flower buds will be certain to fall off. Such also would be the case if an undue application be indulged in. We find Mr. Paxton attributes the falling off of the flower buds to another cause, viz., the sudden changes of temperature; but in our opinion this latter species of mismanagement has less effect upon the *Camellia* than he appears to think.

"The great reason," says Mr. P., "why the flower buds very often fall off, without coming properly into bloom, is, the too sudden changes in the temperature to which they are exposed; for instance, when the buds are nearly ready to expand, a sudden heat causes them to push forth too rapidly; and, on the contrary, a decrease of warmth at that time checks their growth, and, in both cases causes them to fall. It is astonishing how very easily the flower buds, when nearly ready to expand, are acted upon by heat or cold, the variation of only a few degrees will considerably affect them; it is therefore absolutely necessary that great attention should be paid to them at that time, particularly if it be in the winter season; in the spring so much care is not required, as in general each succeeding day is a little warmer than its predecessor; but in the winter months, when the weather is so changeable, and the plants are only excited by artificial means, the greatest care is requisite, in order to keep them from advancing too much, and also not to allow the temperature to decrease, for fear of the flower buds falling off."

*Camellias* may be forced so as to produce their flowers at almost any period of the year.

#### GENERAL TREATMENT WHEN OUT OF DOORS.

Having already stated our opinion upon the propriety of keeping *Camellias* at all seasons under glass, when the structure they are intended to inhabit is properly adapted for them, it only remains for us to observe,

that those which are to be placed for a time in the open air, should be arranged in a situation that is completely shaded from the mid-day's sun, and that they are also placed in a sheltered position, and abundantly supplied with water during dry and warm weather. The period when they can with advantage be so placed is, in most seasons, from the beginning of June till the end of September; but this depends very much upon the progress the young wood has made, prior to the former of those dates. The young wood should be fully formed and partially ripened before they are turned out; at this period the flower buds also will have been formed. In cold wet seasons, it may be necessary to remove them earlier into the house, where they should have air abundantly admitted to them, to ripen the wood and fully mature the flower buds.

#### SOIL.

Some writers recommend peat mould alone; and others, a compound of peat, loam, rotten dung and vegetable mould. Our opinion is, that a light, yellow loam, with a very small portion of peat, is to be preferred; and in this we are borne out by the practice of Messrs. Loddiges, and Chandler and Sons, of Vauxhall, two of the most successful cultivators of this tribe of plants in England.

#### SHIFTING OR POTTING.

The months of February and March, about which period the flowering season is past, are the times recommended for this operation by the most successful cultivators; with a view to obtain large specimens, frequent shifting is necessary, as the roots may extend to the extremity of the balls, while, to obtain abundance of bloom upon moderately sized plants, the best practice is to confine the roots to a reasonable extent, at the same time to give a moderate quantity of water at all times. When the operation of potting is finished, the plants should be placed in a temperature of from sixty five to seventy five degrees, during the day, and from five to ten degrees of less temperature during the night. The application of a mild and somewhat humid heat, at this period, is of vast importance to the growth of the Camellia; for without it, the buds would break weakly, and instead of producing vigorous shoots of from four to twelve inches in length, would only push to the extent of an inch or two, and in the

course of a year or two the plants would assume a stunted and sickly appearance, from which it would be difficult to recover them. The application of heat must not, however, be carried too far, else the consequence would be as bad on the contrary extreme, and the wood produced would be slender and devoid of flower buds. When the young wood has completed its growth, the temperature should be raised to about ten degrees above that recommended ; this increase of temperature is intended to enable the plants to form their flower buds in perfection and abundance. It requires some degree of observation, to ascertain the proper period of thus increasing the temperature, as it should take place just as the young wood has completed its growth, and before it has begun to turn hard, or of a woody texture.

## SELECT LIST OF CAMELLIAS.

## WHITE.

- Lady Bank's Camellia. (*Ca. Sasanqua*.)  
Flowers in February and November,  
in peat and loam. Inarching, graft-  
ing, budding, laying, and cuttings.
- Lady Bank's double white Camellia.  
(*Ca. Sasanqua plena alba*.) Flowers  
in February and November, in peat  
and loam. Inarching, generally, as  
is the case with all the family.
- Lady Bank's semi-double white Cam-  
ellia. (*Ca. semi-plena alba*.) Flow-  
ers in February and November, in  
peat and loam. Inarching.
- Spotted Camellia. (*Ca. punctata*.)  
Flowers in February and May, in  
peat and loam. Inarching.
- Rose-of-the-World Camellia. (*Ca. rosa  
mundi*.) Flowers in February and  
May, in peat and loam. Inarching.
- White anemone-flowered Camellia.  
(*Ca. anemoneflora alba*.) Flowers in  
February and May, in peat and loam.  
Inarching.
- Sabin's Camellia. (*Ca. Sabiniana*.)  
Flowers in February and May, in  
peat and loam. Inarching.
- Allnutt's Camellia. (*Ca. Allnuttia*.)  
Flowers in February and May, in  
peat and loam. Inarching.
- Single white Camellia. (*Ca. alba*.)  
Flowers in February and May, in  
peat and loam. Inarching.
- Flavescent Camellia. (*Ca. flavescens*.)  
Flowers in February and May, in  
peat and loam. Inarching.
- Welbank's Camellia. (*Ca. Welbankii*.)  
Flowers in February and May, in  
peat and loam. Inarching.
- Variable white Waratah Camellia.  
(*Ca. variabilis*.) Flowers in Fe-  
bruary and May, in peat and loam.  
Inarching.
- Fringed white Camellia. (*Ca. fim-  
briata*.) Flowers in February and  
May, in peat and loam. Inarching.
- Press's eclipse Camellia. (*Ca. eclipsis*.)  
Flowers in February and May, in  
peat and loam. Inarching.
- Compact Camellia. (*Ca. compacta*.)  
Flowers in February and May, in  
peat and loam. Inarching.
- Palmer's Camellia. (*Ca. Palmerii*.)  
Flowers in February and May, in  
peat and loam. Inarching.

## RED.

- Single red Camellia. (*Ca. rubra*.)  
Flowers in February and May, in  
peat and loam. Cuttings.
- Reticulated Camellia. (*Ca. reticulata*.)  
Flowers in April and June, in peat  
and loam. Inarching.
- Semi-double red Camellia. (*Ca. semi-  
duplex*.) Flowers in February and  
May, in peat and loam. Inarching  
or grafting.
- Double red Camellia. (*Ca. rubro plena*.)  
Flowers in February and May, in  
peat and loam. Inarching.
- Flesh-coloured Camellia. (*Ca. carnea*.)  
Flowers in February and May, in  
peat and loam. Inarching.
- Thick-nerved Camellia. (*Ca. crassi-  
nervis*.) Flowers in February and  
May, in peat and loam. Inarching.
- Expanded Camellia. (*Ca. expansa*.)  
Flowers in February and May, in  
peat and loam. Inarching.
- Shell-flowered Camellia. (*Ca. conchi-  
flora*.) Flowers in February and  
May, in peat and loam. Inarching.
- Long-leaved Camellia. (*Ca. longi-  
folia*.) Flowers in February and  
May, in peat and loam. Inarching.
- Myrtle-leaved Camellia. (*Ca. myrti-  
folia*.) Flowers in February and  
May, in peat and loam. Inarching.

- Dark red Camellia. (*Ca. atrorubens.*) Flowers in February and May, in peat and loam. Inarching.
- Anemone-flowered Camellia. (*Ca. anemoneflora.*) Flowers in February and May, in peat and loam. Inarching.
- Involute Camellia. (*Ca. involuta.*) Flowers in February and May, in peat and loam. Inarching.
- Hexangular Camellia. (*Ca. hexangularis.*) Flowers in February and May, in peat and loam. Inarching.
- Carnation-flowered Waratah Camellia. (*Ca. dianthiflora.*) Flowers in February and May, in peat and loam. Inarching.
- Red-stemmed Camellia. (*Ca. rubri-caulis.*) Flowers in February and May, in peat and loam. Inarching.
- Aucuba-leaved Camellia. (*Ca. aucubae-folia.*) Flowers in February and March, in peat and loam. Inarching, grafting, or budding.
- Great-flowered Camellia. (*Ca. grandiflora.*) Flowers in February and May, in peat and loam. Inarching.
- Dwarf Camellia. (*Ca. nana.*) Flowers in February and May, in peat and loam. Inarching.
- Aiton's Camellia. (*Ca. Aitonii.*) Flowers in February and May, in peat and loam. Inarching.
- Flowery Camellia. (*Ca. florida.*) Flowers in February and May, in peat and loam. Inarching.
- Splendid Camellia. (*Ca. splendens.*) Flowers in February and May, in peat and loam. Inarching.
- Beautiful Camellia. (*Ca. concinna.*) Flowers in February and May, in peat and loam. Inarching.
- Wood's Camellia. (*Ca. Woodii.*) Flow-ers in February and May, in peat and loam. Inarching.
- Rose-like Camellia. (*Ca. rosea.*) Flow-ers in February and May, in peat and loam. Inarching.
- Berlezi's Camellia. (*Ca. Berleziana.*) Flowers in February and May, in peat and loam. Inarching.
- Gray's Camellia. (*Ca. Graya.*) Flow-ers in February and May, in peat and loam. Inarching, budding, or grafting.
- Ross's Camellia. (*Ca. Rossii.*) Flow-ers in February and May, in peat and loam. Inarching.
- Spatulate Camellia. (*Ca. spatulata.*) Flowers in February and May, in peat and loam. Inarching.
- Hollyhock-flowered Camellia. (*Ca. althæiflora.*) Flowers in February and May, in peat and loam. In-arching.
- Press's Camellia. (*Ca. Pressii.*) Flow-ers in February and May, in peat and loam. Inarching.
- Reeves's Camellia. (*Ca. Reevesiana.*) Flowers in February and May, in peat and loam. Inarching.
- Elegant Camellia. (*Ca. elegans.*) Flowers in February and May, in peat and loam. Inarching.
- Imbricated Camellia. (*Ca. imbricata.*) Flowers in February and May, in peat and loam. Inarching.
- Allnutt's superb Camellia. (*Ca. All-nuttia superba.*) Flowers in Feb-ruary and May, in peat and loam. Inarching.
- Beale's Camellia. (*Ca. Bealeii.*) Flow-ers in February and May, in peat and loam. Inarching, budding, or grafting.

## BLUSH.

- Pæony-flowered Camellia. (*Ca. pæonie-flora.*) Flowers in February and May, in peat and loam. Inarching.
- Blush Waratah Camellia. (*Ca. blanda.*) Flowers in February and May, in peat and loam. Inarching.
- Pomponé Camellia. (*Ca. pomponia.*) Flowers in February and May, in peat and loam. Inarching.
- Colville's Camellia. (*Ca. Colvillii.*) Flowers in February and May, in peat and loam. Inarching.

## SCARLET.

- Coral-flowered Camellia. (*Ca. coral-lina.*) Flowers in February and May, in peat and loam. Inarching.
- Splendid Camellia. (*Ca. insignis.*) Flowers in February and May, in peat and loam. Inarching.
- Scarlet Camellia. (*Ca. coccinea.*) Flowers in February and May, in peat and loam. Inarching.
- Poppy-flowered Camellia. (*Ca. papaveracea.*) Flowers in February and May, in peat and loam. Inarching.

## ROSY.

Elegant Camellia. (*Ca. elegans*.)  
Flowers in February and May, in  
peat and loam. Inarching.

Sweet's Camellia. (*Ca. Sweetiana*.)  
Flowers in February and May, in  
peat and loam. Inarching, grafting,  
or budding.

Neat Camellia. (*Ca. concinna*.) Flow-  
ers in February and May, in peat  
and loam. Inarching.

China rose Camellia. (*Ca. rosa sin-  
ensis*.) Flowers in February and  
May, in peat and loam. Inarching.

## YELLOW.

Pale-yellow Camellia. (*Ca. luteo-alba*.)  
Flowers in February and May, in  
peat and loam. Inarching.

Incarnate Camellia. (*Ca. incarnata*.)  
Flowers in February and May, in  
peat and loam. Inarching.

## VARIEGATED.

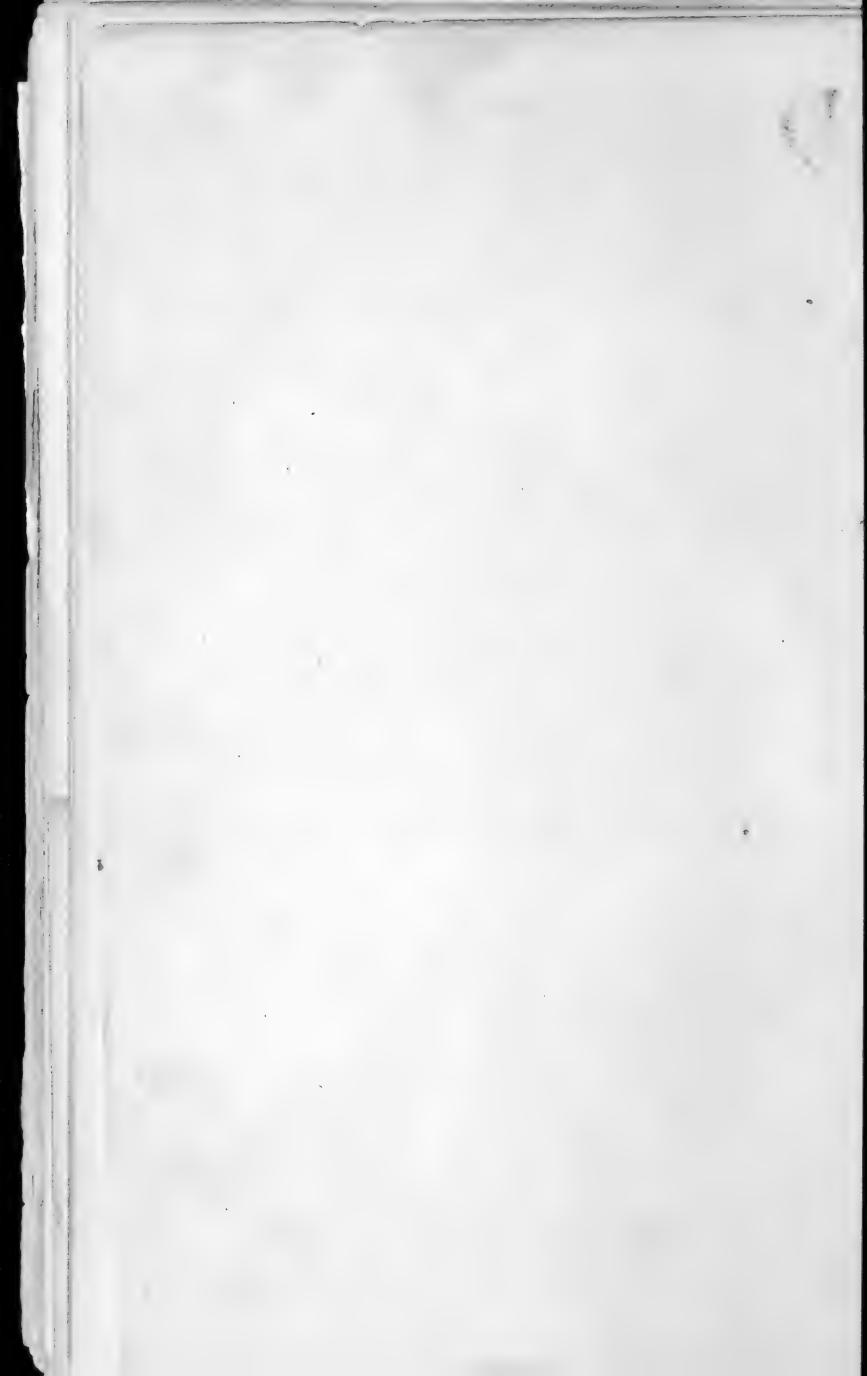
Chandler's striped Waratah Camellia.  
(*Ca. Chandlerii*.) Flowers in Feb-  
ruary and May, in peat and loam.  
Inarching.

Clowe's Camellia. (*Ca. Cloweana*.)  
Flowers in February and May, in  
peat and loam. Inarching.

King's Camellia. (*Ca. Kingii*.) Flow-  
ers in February and May, in peat  
and loam. Inarching.

Single red-spotted Camellia. (*Ca. rubro  
punctata*.) Flowers in February and  
May, in peat and loam. Inarching.







LIST OF CAMELLIAS IN THE COLLECTION OF M. MAKOY,  
AT LIEGE,

WITH THEIR PRICES IN FRANCS.

*This is, perhaps, the most extensive List of Camellias ever published, amounting to 294 varieties, and will shew with what zeal our neighbours on the continent attend to this department. Many of those which are of foreign origin have been introduced into England; some, however, in the annexed List have not yet reached us.*

	f.	f.		f.	f.		
Camellia euryoides grandiflora		6	Camellia Brookiana		25		
rosea			Brownii				
rosea grandiflora	8 à 15		Buckliana				4
japonica		1	Buckii				5
japonica Adelaide			candidissima	8 à 20			7
Adlemanni		5	Campbellii				15
japonica alba grandiflora			*cardinalis		5		0-16
*Aitoni	2,50—	6	carnea	2—10			5-40
albo pl.	2—50		Carswelliana				5
*albo simplex	2—10		*Carolus		4		
*albo simplex striata		5	Casseli				
Almet		5	Chandleri	3—10			7
*Alnut's splendens	4—8		Charles Auguste		4		
althœiflora	3—10		Clawesiana		20		1-50
*amabilis		5	Clintoniæ		4		
*Amherstia		6	cælestina				3-12
anemoniflora (red waratah)	2—50		*Clintoniæ de Knight		7		6
anemoniflora alba	4—8		Cliveana		6		6
anemoniflora rosa de Press		25	*coccinea	3—6			6
Antwerpensis		15	Colla				4
Apunga		6	Colletti		50		
*argentea	3—6		colorata nova	30—50			3
atro-rubens	2—15		Colvillii	10—20			
atroviolacea		6	Colvillii rubra		25		-50
*aucubifolia	3—6		compacta	4—8			10
angusta (Dernii)	7—12		compacta rubra (concolor fol. var.)		15		-60
Barnebiana		10	*conchiflora	2—6			-30
Bedfordii		6	concinna	15—25			-25
*belle Henriette			conspicua		5		
belle de Wilhemshahe			conspicua de Loddeges		50		
*belle Rosalie			corallina (Carolina)	3—25			be
Blackburnia		6	cornation waratah		8		J'ai
*blanda	3—6		coronata		10		rep
			*crassifolia		3		
			*crassinervis		3		

	f.	f.		f.	f.
Camellia cruenta			Camellia Haylockii	25 à 50	
curvatifolia	20 à 30		helvola		
cruenta de Knight	8		Hendersonii		
dahliciflora	7		Herbertii	6	
Daelenii	10—25		heterophylla	3	
Decandolli	6		hexangularis (mons-		
decipiens	5		trosa) (crassinervis		
decora	6		de Lodd	3—6	
delecta	7		hexangularis rosea	4—8	
delectabilis	15—30		Hibbertii	6	
delicatissima	30—40		Hosackii	50	
Derbeyana	4—8		*humilis	3	
*dianthiflora (Knighti)	3—6		*hybrida colorata	6	
*diversiflora	6		ignescens	12	
Donkelaari	25—50		imbricata	10—20	
Dorsetti	4—10		imbricata alba		
double variegated wa-			*impératrice du Bré-		
ratih de Knight	10		sil	5	
eclips (regina gallica-			incarnata	3	
rum)	4—12		*incomparabilis	15	
Drummondii			*insignis	3—30	
dulcis	25—40		*insignis alba	3—30	
Egertonice			*insignis rubra	3—30	
electa			Johnsonii	6	
elata de chandler	25		Juliana		
elata de Rollinson	25		Jussieuui	50—100	
elegans de Chandler			*Kentii		
*elegantissima	3		Kellyana		
Elphinstonian	6		King		
*excelsa (Rollisoni			Knight's cornation		
de Gaud)			war	10	
eximia	7—12		*Knight's single scar-		
exoniensis	4—8		let war		
exquiesita	15—30		Knight's white war		
Fairleya	10		Lamberti	25	
*fascicularis	6		lactea de Young	15—60	
fimbriata	3—10		Lady Eleonore Camp-		
*flaccida	3		bell		
flammea	5		Lansezeuriana	3—6	
flammeola superba			latifolia macrantha	12—25	
flavescens (buff)	2—50		*Lanckmanni	3—6	
florida	3—6		Lehmanni (ardens)		
*foliacea	5		linbriata	3—6	
Floyii	200		Lindleyi (Goussonice)	4—8	
Foordii	15—30		✓Leeana superba		
formosa	5		Lefevriana	10—20	
formosa de young			lepidata	15—30	
fulgentissima	5—10		lucida	3—6	
Francofortensis (Wel-			magnifica	15—25	
lingtonii)	20—40		marmorata	5—10	
Fraserii	12		Martha		
Frederic le Grand	200		Master's double red	5	
fructu pyriformis	5		Mellinetti		
gigantea (fulgida)	4—8		Mexicana		
gloria mundi	6		minuta	40—50	
gloriosa	4—8		*multiflora	5	
*grandissima			mutabilis	12	
*Grayia de Knight	8		myrtifolia	3—50	
Garveyi	25		nivea (gallica alba)		
Gilliesii (Nancy Daw-			nobilissima	20—40	
son)	20—40		ochroleuca		
*Griffini	3		ornata	3	
Greenelii	30—60		*Osbornea	5	
guttata	40		oxoniensis de Knight	6	
Haleysia	5		pæoniflora	2—50	

	f.	f.		f.	f.
Camellia Palmer's striped war		12	Camellia sanguinea nova		
Palmer's white		10	Schrynmakersii		25
*papaveracea de lodiges	4 à 20		sericea	4 à 8	
papavera. de Chandler			serratifolia		35
ler		20	Sieboldii		10
Park's striped		15	*Simsii	3—6	
Parthoniana	20—30		*single waratah		5
*penicillata			*spatulata	3—6	
pendala de Chandler		25	*speciosa simple (staminea)		4
*Percyæ		6	splendens	3—6	
picturata	30—40		Spooffortiana		
pictorum coccineum			spolufera		
*plumaria		6	striata pl.	3—50	
pomponia	2—50		superba	4—8	
Preston's eclips		10	superbissima grandissima		
*prince d'Orange		4	*supina		
princeps	3—6		Susanna	40	
Pronoyana		10	Sweetiana de Gand		
proegnans	2,50—6		Sweetiana vera de Colvill		
pulchella		3	Thomsonii		
pulcherina			Traversii plenissima	10—25	
punctata pl. (Banksiæ)			tricolor	30—100	
(Gray's invincible)			tricolor de Young		
(splendida)	4—10		triumphans		40
punctata major	40—60		*uniflora		5
*purpurascens war		5	Vandesiana		10
ranunculiflora		25	Vandesiana carnea		
Rachel Ruysii		10	Vandesiana superba		
Rawesii (speciosa)			various colour		4
Rathmoriana		15	venosa		5
Reevesiana		15	venusta		7
reine des P.-B.	2—6		Pictori Antwerpensis		15
resplendens	40—50		Vilmoriana	10—16	
Rivinii	5—10		violacia superba	25—40	
roi des P.-B.	2—6		*waratea rosea		5
Rollissonii vera		8	Wadieana		
rosa bengalensis		5	Wallichii		
rosacea	3—6		Watsoniana		7
rosæflora		4	Walter Scott		
rosa mundi	6—15		Welbanckii	2,50—50	
rosa sinensis (Wallnerii)		3—6	Weymarii (pompon 1/2 pl.)		3—12
rose waratah		6—12	Wilbrahamia		6
rosa de la Chine	10—15		Wiltoniæ (parviflora)	3—6	
*rotundifolia			Woodsii	3—6	
Roulinii			*Young's red		4
Rozeanum (Palmer's cornation war)			York et Lancastere		
*rubescens			Kissi		3
rubro pl.	2—50		maliflora (sasanqua rosea pl.)	3—50	
rubro major			oleifera vera		10
rubricaulis (fulgens)	2—50		reticulata	30—60	
Russell's nova			sasanqua	2—30	
Sabinii		15	sasanqua albo duplex	10—25	
*salicifolia		5			
sanguinea	2,50—15				

The intelligent proprietor of the above extraordinary collection appears to be aware that many seedlings of very inferior merit have been perpetuated. "J'ai réforme," he says, "les 69 Camellia suivantes, parce que leurs fleurs sont trop peu intéressantes." These we have marked thus (\*) in the above list.

## MISCELLANEOUS PLANTS, THAT MAY BE CULTIVATED IN THE CAMELLIA HOUSE.

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### RHODODENDRONS.

We have already stated, that the Camellia house is a very proper habitation for the Nepal Rhododendrons, and also for such hybrids of that genus as have been originated by art, and are too delicate to stand in the flower garden, on account of the early season of their flowering. It is necessary that we should say something on their cultivation and propagation.

The Rhododendron seeds freely, and is, from that natural mode of increase, readily obtained. The seeds should be sown as soon after they are gathered as possible, in pots, previously well drained, and filled with peat to within an inch of the top, which latter space should be filled with very fine sifted peat, and the surface made quite smooth and level, upon which the seeds are to be sown, but not covered with mould, as they are so very small, that they are liable to be buried too deep. But to prevent their being washed off in the process of watering, and also to shade them from the sun and air, a thin layer of fine moss should be laid over them. The pots should be placed in a cool, shaded place, where the atmosphere will be as uniform as possible around them, for they are very impatient of extreme drought, damp, or sudden changes. For greater security, they may be covered with bell or hand glasses. When the young plants are about an inch high, they should be potted into small pots; two, three, or more plants in each, and placed as close to the edge of the pot as possible, and gradually exposed to the air, until they can stand it without protection. After sowing, and during summer, a very proper situation for seedling pots of Rhododendrons, would be under the shelter of some large spreading evergreen; and during winter, upon a shelf in the Camellia house, close to the glass, or in a cold frame, or pit, free from damp, and from which frost is excluded.

Rhododendrons are easily increased by grafting, and also by inarching

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in a similar way with Camellias, as already noticed. They are sometimes increased by layers; but this latter mode is seldom employed, unless in the case of the more ordinary sorts.

Their treatment is altogether so much like that of Camellia, that any separate directions upon that head here, might be deemed superfluous, farther than that they require a peat soil, and cannot be over-watered while making their young wood. This treatment agrees very nearly with that they experience in their native places of growth, which is towards the bottom of the Nepal mountains, where they are partially irrigated, in consequence of the melting of the snow on the mountains above, which takes place about the time they begin to shoot in spring, and lasts during the period they are making their young wood. The remainder of the year, they are comparatively dry.

Of course, the proper stock on which to graft or inarch the finer species, such as *arboreum*, *arboreum flo. album*, *nepalense*, *cinnamomeum*, *setosum*, *campanulatum*, *aromaticum*, and the English hybrids, *Russellianum*, *altalerense*, *Smithii*, &c., are plants of the commoner sorts, potted and trained on purpose. We ought here to observe, that grafted plants of the Rhododendrons never make so good plants as those originated from seeds; and if we are to give credit to the doctrine laid down by our enlightened countryman, T. A. Knight, Esq., and others, trees have a stated period of existence, and grafts, or cuttings taken from them, do not survive much longer than the term allowed to the original plant; we may, therefore, expect to lose, ere long, some of the present fine varieties; and should pay regard to the production of new ones from seed. This is a doctrine, however, which is denied by most of the continental writers, as well as by some of our own authors. To us it appears a matter of very little consequence; for, supposing every Rhododendron which existed in this country ten or a dozen years ago was totally lost, we have hundreds of varieties originated from seeds within that period, that are infinitely superior to any of them, for every purpose of ornament, whether as decorations for the greenhouse, conservatory, or flower garden. Seeds of the finer Nepal sorts, are from time to time brought to this country, and the art of man is increasing new varieties every year.

#### MAGNOLIAS.

The species of this genus that may be advantageously cultivated in the

Camellia house, are those that are natives of China, viz. *tomentosa*, *obovata*, *fuscata*, *anonæfolia*, *pumila*, and the hybrid *Soulangiana*.

These are all plants of easy culture, requiring just the same treatment as Camellias. They are increased principally by grafting and inarching upon stocks of *M. purpuria*, and sometimes by buddings, cuttings, and layers; the former is by far the most expeditious and certain mode.

#### NERIUM OLEANDER.

This splendid species, with its varieties, is very readily multiplied by cuttings, planted in light, rich soil, and placed in a mild bottom heat, without covering. They also root freely, if the ends of the cuttings be placed in a bottle of water, and placed in a frame, or hot house. A light, rich soil, is most proper for the plants when rooted, and an abundance of water at all times: the very name, *Nerium*, is derived from damp, because the plants grow naturally upon the banks of rivers, and in marshy places.

This is an old inhabitant of our greenhouses, having been introduced from the south of Europe in 1596; and if attention is paid to its cultivation, which is exceedingly simple, few plants are more beautiful when in flower, and in that state it remains a long time.

#### ILLICIUM FLORIDANUM.

The foliage of this plant is exceedingly fragrant; so much so, that the name is derived from *Illicio*, to attract. The Chinese use the leaves and flowers for seasoning some of their finest dishes, while their neighbours, the Japanese, decorate the temples of their deities, and the tombs of their friends with the branches of this plant. The most usual method of increasing this species, and also *I. anisatum*, is by layers, but the ripened wood of both roots will vegetate in time, if planted in sand, or sandy peat and loam, and placed in a cool frame, and otherwise treated as directed for Camellias.

#### DAPHNE ODORA.

This very odqiferous plant is readily increased by cuttings of the young shoots planted in sand, or light peat and loam, in a slight bottom heat, and close, moist atmosphere. Light peat and loam, of equal quantities, is the



proper soil for them to grow in. To flower them well, the cultivator must be sparing of the knife, as the terminating buds of the shoots produce leaves, and the lateral ones flowers : a circumstance noticed by Linnæus as being characteristic of this genus.

*LUCULIA GRATISSIMA.*

This very fragrant plant is readily increased by cuttings of the ripened wood, and also by layers, either in heat or not. The soil best adapted for it is sandy loam and peat.

*KENNEDYÆ, VARIOUS SPECIES.*

These all seed freely when old plants, and from them a plentiful supply of young ones can always be obtained. They also strike by cuttings planted in sand and covered with a glass, in a cool place. Peat and loam is the proper soil for all the genus.

*WISTERIA CHINENSIS.*

This splendid flowering plant should have a place in every garden, both in the greenhouse, and on the open wall, where it flowers abundantly, but is sometimes liable to be injured by late spring frosts. It is a very good plan to adopt with this plant, to plant it against a wall near to the Camellia house or greenhouse, and to train it not only on both sides of the open wall, but also to introduce a branch of it into the Camellia house or greenhouse, when it will come into flower earlier than on the wall, and be secure from the frost. The branches trained on the open wall, will flower also in succession ; those on a south aspect first, and be succeeded by those on the north. The plant is rapidly increased by laying the shoots in pots plunged in the ground at the bottom of the wall. It sometimes produces seeds.

*CAPRIFOLIUM JAPONICUM AND JASMINUM GRANDIFLORA,*

Are both much esteemed for the fragrance of their flowers, and also for their beauty. They are both readily increased by cuttings of the ripened wood, planted in sand, under a glass, in a cool place. They also luxuriate in a soil of equal parts of light loam, peat, and very rotten dung.

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## TECOMA GRANDIFLORA.

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This splendid plant is a native of China, but is sufficiently hardy to flower well in the open air of this country. Plants of it have existed against a wall in the gardens at Claremont, and elsewhere, for the last twenty years. It is, nevertheless, well worthy of a place in the Camellia house, where it will flower earlier than upon the open wall. It succeeds in a soil of peat and loam, and is increased by eyes planted in pots, placed in a mild temperature. These must of course be taken off early in spring, cut to about an inch and a half in length, and covered about half an inch with mould, in the same manner as practised for propagating vines. We believe this method was first practised in the Claremont gardens; but is now pretty generally followed. Formerly, this plant was rare, and considered difficult to increase: the usual method being by cuttings of the roots, and by laying. Plants originated from single eyes, frequently flower the same year, when about a foot high.

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## PASSIFLORA LOUDONII, AND P. KERMISINA,

Are two splendid varieties of this popular family. They are increased by cuttings of the young shoots planted in sand, and covered with a glass, and also by layers, and seeds, when the latter can be obtained. Any moderately rich, light soil suits them; and, contrary to the generality of the genus, will flower well in a low temperature.

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GREENHOUSE SHRUBS.



*Euphorbia fulgens.*

*Tuesonia Pinnatifida.*

*Hovea celsi.*

*Erythrina cristi-galli.*



## THE BULB HOUSE.

“**BULBOUS-ROOTED** plants associate almost as ill with other plants as succulents do; and therefore, wherever a good collection is kept, there should be a house entirely devoted to their culture.” Such is the opinion of the Editor of the Encyclopedia of Gardening, and in this opinion we cordially agree. “The roof should be low and not very steep, and the pots should be kept on a level stage, or platform, raised table high, or about two foot and a half, that the flowers may be near the eye. A house with glass on all sides, and a central platform six or eight feet wide, and two side ones, or side borders, about three feet wide, would form an excellent house for plants of this description, as all of them would be near the glass and near the eye of the spectator. Whenever the bulbs cultivated in such a house become in a dormant state, they should be removed to a pit, or frame of proper temperature in the reserve garden, and kept there dry till the growing season. Exotic bulbs require nearly the same degree of heat when lying dormant as when they are growing.”

Bulbous-rooted plants require a different mode of culture from plants in general, and are, both before and after flowering, unsightly in their appearance, and consequently they contribute little to the ornament of the house in which they grow. While in flower, few sections of plants exhibit a more varied, rich, and gay appearance, and by good management and a proper selection of kinds, a display of flowers may be kept up during the greater part of the year.

“They appear,” says the Honourable and Rev. W. Herbert, “to have gone out of favour lately with cultivators, probably from failure through mismanagement, for certainly they can be surpassed by few flowers in beauty; and most of them may be cultivated in a warm greenhouse, if they are kept quite dry in the winter; but it should always be remembered, that very tender bulbs which are to be kept dry in the greenhouse, will rot if above ground, from the dampness of the atmosphere, though they would have been uninjured if closely covered by dry earth.”

We here beg to be understood as alluding to the greenhouse and stove species of bulbous plants, of which the following genera forms the principal

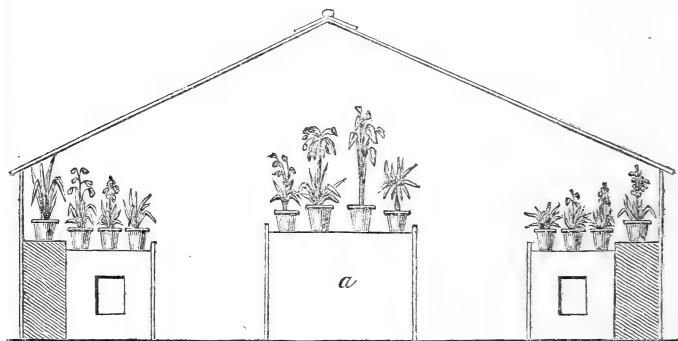
mass. *Amaryllis*, with their numerous hybrid varieties, *Autholiza*, *Clivea*, *Coburghia*, *Chlidanthus*, *Eucrosia*, *Babiana*, *Cyrtanthus*, *Eucomis*, *Galaxia*, *Gladiolus*, *Hemanthus*, *Strumaria*, *Brunsvigia*, *Nerine*, *Ixia*, *Oxalis*, *Luchenaia*, *Massonia*, *Moræa*, *Polyanthes*, *Wachendorfia*, &c., as true bulbous plants, and to which we may with some propriety add the splendid genus *Alstræmeria*, *Gloriosa*, *Tropæolum*, *Cyclamen*, &c.

A house furnished with such genera as the above, would have a very interesting and imposing effect, and as there is perhaps no example of the kind in existence at present, should these remarks lead to such a result, we are satisfied that the gratification of the owner, would be equal to our utmost anticipation.

The more tender bulbous plants, and such as are most nearly allied to them, will be treated of when we come to the cultivation of hot house plants.

#### STRUCTURES CALCULATED FOR BULBOUS PLANTS.

We have above remarked that a house glazed on all sides and of no great height, is the most proper sort of structure for the successful cultivation of these plants. The annexed diagram will explain our views.

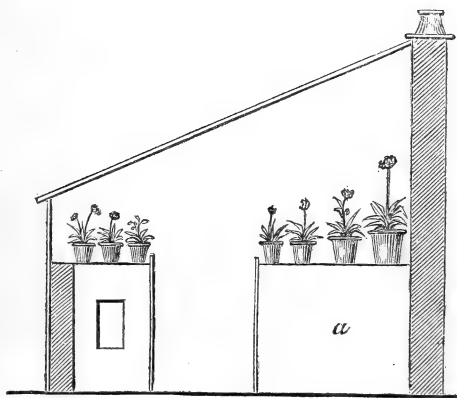


It represents a span-roofed form, eighteen feet wide, and seven feet and a half in height over the pathways. In the centre is a platform upon which the largest plants are intended to stand; this platform should be formed over brick arches, and rendered capable of holding water upon its surface,

for the double purpose of keeping the roots of the plants moist and cool while they are in flower, and more especially when they are making their young leaves, which is the most critical period of their growth; for unless these be fully developed, the chance of having fine flowers, if any, will be small. This table is also required to be rendered capable of holding water, because the bulbs, when in a dormant state, are intended to be deposited underneath, in the cavities at *a*, and it would be much too damp for this purpose if the spilt water only from the pots above it were allowed to fall. The water that may not pass off by evaporation from this platform should be emptied, by having one or two pipes through which it would pass to the drains under the house.

The platform between the footpaths and sides of the house, are for the smaller kinds of bulbous plants, such as *Ixiu*, *Oxalis*, and *Alstræmeria*. Such a house as this might be completely heated by the common smoke flues, or hot water pipes: the situation for either to be under the side platforms.

Should such a house be considered too large, or the situation not be favourable for one upon this principle, the accompanying diagram may be



considered a good substitute. The breadth of this house may be ten or twelve feet, seven feet and a half in height over the footpath, having a water-tight platform, as above described, for the reception of the larger species of bulbs; and a front platform, over the flue, for those of a smaller growth. The space under the larger platform at *a*, is intended for the reception of plants when in a dormant state.

## PROPAGATION AND TREATMENT WHILE YOUNG.

Many species of bulbous-rooted plants produce seeds, and the majority of them produce offsets, which are either small, or imperfectly formed bulbs, but which, by cultivation for a longer or shorter period, according to their various habits, become of sufficient size and perfection to produce flowers. These offsets are to be taken off when the plant is in a state of rest, which happens in most sorts when they have done flowering.

Some kinds of bulbous-rooted plants do not readily increase by offsets; such as are of the tunicate shape are of this order. A tunicated or coated bulb, (*bulbus tunicatus*), consists of a number of tunics, or coats, which are regularly laid over each other; the common onion furnishes an example of this bulb. Such bulbs, if cut over transversely a little above the middle, will form young bulbs in abundance near the margin of the outer coat. As there is some danger of a bulb so treated rotting off before the young bulbs have time to form, particularly if kept in a damp situation, we would suggest the application of finely powdered charcoal, or caustic lime dust being applied daily, to dry up the sap which will flow from the wound, and which, if not stopped, or dried up, will cause decay to take place.

Many bulbous-rooted plants produce seeds in abundance, both naturally and artificially. By the latter mode, the late Mr. Sweet, the Hon. and Rev. William Herbert, and others, have originated many splendid hybrid varieties, particularly of that splendid genus *Amaryllis*. Seeds being obtained, proceed to sow them as soon as they are ripe, if that does not take place after July; but if later, they had better be kept till the beginning of next March, for if they were brought into a state of vegetation towards autumn, there would be a great risk of losing them during the winter; whereas, if sown early in spring, they have the whole summer to grow in, and will have attained a state, before the following winter, to secure themselves from harm. It is of little use to sow seeds of any free vegetating plant during winter, for they do not in general germinate, but remain inactive, in a state, perhaps, very similar to the torpid condition of many animals; but on the coming of spring, the "penetrative sun" rouses the embryo from its slumber into animated life.

Light, rich, sandy loam, with a part of well decomposed leaf-mould, is the best soil in which to sow seeds of all bulbous-rooted plants. The pots should be well drained, but at the same time, too much of their space should not be taken up with the drainage, because the roots of bulbs



penetrate to a considerable depth ; and, hence, would be impeded in their progress, if sufficient depth of mould was not allowed for them.

When the seeds are sown, they should be moderately watered ; for water is the principal agent in promoting germination, and without it, seeds would remain for ever in a dormant state. If the seeds of *Amaryllis*, which are not very small, be covered with finely sifted mould, similar to that on which they are sown, to the depth of one eighth of an inch, and larger or smaller seeds in a relative proportion, they will vegetate freely. Seeds, if too deeply covered, will not vegetate at all, because they are placed beyond the influence of air, and different seeds seem to require very different quantities of air, in order to further their germination. In order that seeds may germinate readily, it is not only necessary to expose them to the influence of the air, but that the air should be pure, or at least as pure as that of the atmosphere. The experiments of M. Achard and other philosophers, have proved that seeds will not germinate in azotic gas, carbonic acid gas, nor hydrogen gas. Bierkander, a Swedish author, has instituted some curious experiments relative to the germination of seeds of various kinds, at different depths under ground. He found that the seeds of flax would never vegetate if buried below a certain depth in the earth. And the seeds of black oats, after having lain deeply buried in the ground in a soil in Scotland for half a century, grew vigorously when the ground was trenched up and the seeds brought nearer to the surface.

The pots in which the seeds of bulbous-rooted plants are sown, should be placed in a cool pit or frame, till they have vegetated, afterwards they will only require to be regularly watered, kept free from weeds, and fully exposed to the sun and air, the great object being to enable them to form as large and perfect leaves as possible, and to prolong the season of their growth to as late a period of the autumn as possible. When the foliage begins to turn yellowish, water should be gradually withheld, and as the foliage dies off it should be discontinued entirely. During winter, the young bulbs should be kept dry in the pots till spring, when they are to be taken out, re-potted, and excited into vegetation the following season. The best place in which to keep such pots during winter, is in the cavity formed under the platform, as represented in our diagrams ; and, when such is not provided for them, placing them on a dry shelf, where no water can reach them, during their season of rest, will be nearly as well. They may also be placed under the stage of any ordinary greenhouse or pit, where frost or damp cannot injure them, laid over on

their sides, which will take up less room, and more effectually guard them from damp, than if they were placed in the usual position.

The young bulbs from seed should be planted in February or March, the second year, and placed in a pit or frame, supplied with water, air, and light, in full abundance; the soil should be light, but of the richest description possible, viz., completely decomposed dung, a small portion of light yellow loam, and about an equal portion of pure gritty sand. Every attention should be paid to enable them to develop their foliage of a large and full size, for on this depends the size of the bulbs. Some few bulbs will flower the third year after this routine, but by far the greater part will not flower till the fourth, fifth, and sixth year from seed.

#### GENERAL MANAGEMENT OF BULBOUS-ROOTED PLANTS.

The management of exotic bulbous-rooted plants is much less generally known to gardeners, than the management of any other section of plants whatever, if we except that of Orchideæ. The whole art of cultivating bulbs well, depends on the attention paid to two particular points, viz., the season when they are put into, and the length of time that they remain in a state of rest, and the perfection to which their foliage is brought during the season of growth. The most rational period for putting all bulbous plants into a state of rest, is soon after they have flowered, and while their leaves are beginning to decay. It is extremely injurious to take up any bulb, or even to destroy a single leaf, while it is in a growing state, for it should be remembered that it is the leaves which bring the roots to maturity, and prepare it for flowering the following year. The loss of a single leaf may be the cause of a bulb not flowering for a year or two afterwards.

The length of time that bulbs should be kept out of the ground, or kept in a state of rest, depends on their habits as to flowering. Some kinds require one month, while others of the same genus may be kept for three months in a state of rest without injury. This is one of the many points in gardening that practice and observation alone can teach. It may be laid down, however, as a rule, from which there are very few exceptions, that no bulb should be kept out of a state of growth after it has once shown symptoms of vegetation, nor should that vegetation be impeded, in the slightest degree, from the period of its first commencement, till the foliage is perfectly matured and beginning to decay.

Bulbous-rooted plants require to be frequently taken up, to remove such

young bulbs as form round their sides, which, if not displaced, would rob the principal bulb of its due share of nourishment, and consequently, deprive it of the power of producing its flowers; some species of this tribe also form their young bulbs under the old ones, so that in course of time they would get so deep, if planted out, as at first to send up weak stems, and ultimately to cease to appear; and, if in pots, would get so low in them, that they would not have room for their roots to extend in search of nourishment.

Besides this regulation of the roots, in regard to number, there is also another important reason for either taking bulbs out of the mould once a-year, or for placing them in a state of rest, and that is, their being thereby rendered more excitable when again planted, which evidently is the case with bulbs that have been kept for a reasonable time in a dormant state.

The late botanist Sweet, who studied the culture of *Amaryllis* and other similar bulbs in the once celebrated collection of the late Mr. Colville, found the advantage of turning out the bulbs from the pots when the leaves had ripened; and when divested entirely from the mould, he laid them upon shelves, in a dry, moderately warm situation, leaving them until they began to show flowers, when they were taken out and potted. This practice, in our opinion, has some considerable advantages, for, that during their season of repose they occupy little space, are kept perfectly inactive, and are secure against the attacks of vermin. But this mode of treatment Mr Sweet did not consider applicable to all the genus, for he remarks, that "*Amaryllis, reticulata*, and *striatifolia*, or the mules raised from them, will flower much better by remaining in pots all the year, as do also *A. aulica*, *calyptrata*, *Solandraeflora*;" but these of course must be kept dry, so as to remain quite dormant, otherwise they will not flower with certainty. "*A. reginæ*, *crocata*, *rutila*, *accuminata*, *fulgida*, *Johnsonii*, *psittacina*, and the mules between them, are much better turned out."

When the production of fine flowers is more an object of desire on the part of the cultivator than the multiplication of plants, we would say, destroy all young plants as they appear above ground round the old bulb; and this may be done with great ease and safety by displacing a portion of the mould round the bulb, and rubbing off the offsets, either with the finger or a piece of blunt stick. By this practice, a great accession of strength is given to the main plant, both for the display of blossom during the current year, and also for invigorating the leaves to prepare and deposit nutriment in the bulb for the succeeding year. And, in con-

formity with the same rule, every flower should be cut off as soon as it begins to decay, but not sooner, as an immense expenditure of sap would take place by cutting the flower stalk while in full vigour. The flower stalk should remain until the leaves have finally decayed and are falling off.

When bulbs are excited in spring, the progress of vegetation should be allowed to proceed slowly and gradually, increasing the stimulus as the plant proceeds and the days lengthen, for bulbs excited rapidly seldom flower well, if at all, and often make such small and imperfect foliage as unfits them for preparing and depositing nutriment to the bulb for the succeeding season. Although almost all bulbs force well if properly treated, few of them will flower well if excited rapidly.

During the growing season, they require all the light and sunshine possible, with a liberal supply of air and water, the latter in greater abundance than most other plants not actually aquatics. Bulbs also differ from most other greenhouse plants, in another particular, namely, that they do not require to be set out in the open air during summer. Indeed, all the advantages of the climate of a greenhouse or pit, is no more than they require to perfect their foliage and ripen their bulbs to perfection.

#### SOIL.

We have already remarked that most bulbous-rooted plants require a rich, light soil. That prepared by adding to one half rich, light, turfy loam, another half completely decomposed stable yard dung, with a portion of quick sand, will be an excellent compost for flowering strong bulbs. A lighter and equally rich compost should be used for more tender and delicate bulbs; and for the most common of all, any moderately good garden soil, not peaty, will be quite sufficient. Some genera require a slight difference in regard to soil, of which notice will be taken under their respective heads.

#### SHIFTING AND POTTING.

A general examination of bulbous plants should take place about the beginning of March, every spring, but individuals will require to be potted if they have been kept out of pots during their period of rest, as well as

others that may have been kept in pots during that period, whenever they show symptoms of vegetation, whether in spring, autumn, or mid-winter. The pots best suited for bulbs should be rather deeper than those in common use, because the roots of all bulbs penetrate to a considerable depth perpendicularly, and being both tender and brittle, if once broken or impeded in their progress, cease to grow; consequently, the plant, by being deprived of its due share of nourishment, will receive a check which will be very injurious to it, and, if many of the roots are so circumstanced, the foliage will begin to decay before it has performed its proper function. In preparing the bulbs for potting, all the fragments of the old roots, if any remain, should be removed, and also any loose skin that will part from the bulb freely, should be rubbed off.

The pots should be very well drained, as, during their growth, a considerable quantity of water will be given them, which, if allowed to remain stagnant in the mould, would be of serious consequence to the plants. Deep planting is to be avoided; therefore, placing the bulb only so far into the mould as to keep it in a steady perpendicular position, will be all that is requisite.

#### AMARYLLIS.

Some few of this extensive genus require the temperature of the stove, of which notice will be taken in the proper place. The majority, however, of the species, and almost all the hybrids, will flower to admiration in the bulb house, and many of them even in the most ordinary greenhouse; while *A. Belladonna*, *pumila*, *pudica*, *vittata*, and several others, will flower well in a warm border, protected during winter with a covering of moss, fern, or dry litter.

The following excellent directions on the cultivation of this family, and those most nearly related to them, have been laid down by the late Mr. Sweet, who had more experience in their culture than any man of his day. "The bulbs having been grown in frames and pits all the summer, were removed to the hot house in autumn, when they had ceased growing. They were then laid on shelves in the house, and as the leaves and roots began to decay, they were cleared away, that they might not injure the bulbs. As soon as the bulbs became dry and hard, some of them began to show flower, and others continued to do so all the winter and spring, seldom being less than a hundred, sometimes two or

three hundred in flower together, when scarcely any other plant was in bloom. As soon as they show for bloom, they should be potted, and the sooner the better, as they draw up weak, and do not flower so well, if allowed to remain too long after showing bloom. As soon as potted, they must be placed in the hot house, [bulb house] giving them but little water at first, but as the pots get filled with roots, they will require a greater supply. The sorts that succeed best by turning out are *A. reginæ*, *crocata*, *accuminata*, *rutila*, *fulgida*, *psittacina*, and *vittata*, and all the hybrids that have been produced from them. *A. aulica*, *calyptrata*, *Solandraeflora*, and *reticulata*, do not like turning out so well, as it is their nature to continue growing all the year through, and the hybrid productions from those partake of the nature of their parents. They only require to be kept dry a considerable time in their pots, to make them flower, except any get sickly, or the mould gets soddened at their roots; they should then be laid by to dry for a considerable time, or they will be apt to rot."

In regard to soil, Sweet remarks that, "*A. reticulata* and *striatifolia*, succeed best in light, turfy loam, rather more than one third of white sand, and the rest turfy peat; the use of the turfy soil is to keep it from binding or getting hard in the pots, which it will do if sifted fine: the fibres in the turfy soil also keep it open, that the roots may pass readily through it."

*A. formosissima* requires a rich soil, and may be advantageously cultivated if placed out in spring, and taken up and dried when the foliage is ripe. This species is perfectly hardy, and has flowered annually in a warm border in the Claremont gardens in spring, and occasionally again in autumn. In the greenhouse it requires a low temperature, and also a season of perfect rest. This is a very common species, but it does not, to our knowledge, ever produce seeds in this country, notwithstanding the follen is both abundant and perfect, a circumstance also noticed by Mr. Herbert, who concludes that its semenation depends upon some very nice adaptation of temperature and moisture.

In an extensive genus like *Amaryllis*—we speak of it here as originally constituted, without reference to its latter sub-divisions—there must of necessity be some difference in the cultivation, in consequence of the several latitudes, altitudes, and situations in which they are found. *A. calyptratum* has been found to flourish in a light soil, placed on the hot house flue, and kept growing all the year, but when transferred from that situation into the green house, it languished and died. *Psittacinum*, and the hybrids between it and *vittatum*, are hardy greenhouse plants,

requiring rest during the winter; in the stove they become weak, and finally cease to flower. *Solandraeflora* and *Stylosa* are tender stove plants, requiring rest during the winter; *Vittata* is extremely hardy-flowering in the open borders, and also requiring rest in winter; *Reticulata* and *Striatifolia* are tender stove species, requiring rest during winter; *Equestris* is a native of the hottest parts of the globe, but will not long exist if kept in active excitement in the stove, however high the temperature may be; during its period of rest, it should be kept in a moderately cool place, and is even found to perfect its foliage if placed out of doors during summer.

In regard to the culture of that splendid plant *A. Josephinae*, now *Brunsvigia Josephinae*, Mr. Herbert has the following remarks: "As they sprout but once a-year, nothing can be done to accelerate their growth, beyond keeping them in a healthy, vigorous state; for which purpose, the bulb must be kept under ground, with the neck, perhaps, above ground;" but of that he entertains great doubts. "If the whole bulb is exposed, it imbibes moisture from the atmosphere in the season of rest, which becomes fatal to it; and I have found seedlings, of which the neck has never been raised above ground, in the safest state. A rich, light loam, and abundance of water in winter, with perfect rest and dry heat in summer, are necessary."

## CLIVEA,

Although not properly a bulbous-rooted plant, is so nearly related to them in habits and culture, that we are induced to place it amongst them in the bulb house. This plant, of which there is as yet only one species, is usually kept in the hot-house; but it is so hardy, that it may be kept perfectly safe during winter in a cold pit, or frame. It is increased by separating the roots, and also by seeds, which it produces freely. Although it does not shed its leaves, it still requires a season of rest, which commences soon after it has done flowering and while its seeds are ripening. It should then be but moderately supplied with water, and when potted, kept high in the pot.

## COBURGHIA.

This genus, like the last, is also often injured by being kept in a stove temperature; and hence, probably, is the cause of its being considered a

shy flowerer. The Bulb house, or even common greenhouse, is a much better temperature for it, and even in a cold pit protected from frosts during winter, they have flowered in full perfection. During the season of rest, this genus, of which there are as yet only two species, are better taken out of the pots and kept in paper bags until the season of planting arrives. Contrary to the generality of bulbous-rooted plants, this genus succeeds better in a strong, rich soil, than in one so light as suits the majority of other bulbs. They increase readily by offsets, and will flower in a warm border in the open air.

#### GLORIOSA SUPERBA.

This superb plant is not so frequently seen in flower in our plant houses as we could wish to see it, and this is entirely owing to the circumstance of cultivators paying too little attention to the principles of vegetable life. Every plant has two distinct states of existence, one of quietude and repose, and another of development and display. This is clearly illustrated amongst tropical plants, but in none more so than in the various genera of bulbous-rooted plants. An erroneous opinion has long very generally been entertained, and we regret to say, that with many the opinion is still entertained, that plants, natives of the tropics, require an undiminished temperature and humidity throughout the year, and the more plants shew the effects of their natural habits, the more do many cultivators endeavour to counteract them, by stimulating them to the utmost possible degree, thus endeavouring to keep them in a state of perpetual excitement, instead of allowing nature to take its due course, and give them their natural season of repose. For the method of culture of *Gloriosa superba*—See *Article on Culture of certain fine-flowering stove plants that require a mode of treatment different from the generality of tropical plants*, which will be given under the section STOVES.

#### CHLIDANTHUS.

This genus, of which as yet there is but one species, succeeds best in a soil composed of sandy loam and peat; but not enriched by the addition of any kind of manure. When the leaves have ripened, and are falling off, the bulbs should then be placed in a dry, warm situation, where they may either remain in the pots, or be shaken out and kept in paper bags till they show signs of vegetation, when they should be again planted. Like



the Guernsey lily and other Amaryllis, they flower before the leaves appear; therefore, instead of having water withheld from them as the flower fades, they should have it in abundance, as at that period the foliage begins to appear; and, as we have already observed of bulbs in general, every means should be used to encourage the full development of the leaves, for upon that depends, in a great measure, the perfection of the flowering of the plants the succeeding season.

## EUCROSIA.

A light, turfy soil is best for this genus, into which the bulbs should not be deep set, and through its culture much less water is required than for most other plants of this tribe.

## ANTHOLYZA.

This genus of Cape bulbs requires a light, rich soil. The bulbs should be annually taken up to separate the smaller ones from the larger, as the latter only will flower well. They might be kept in bags during their season of rest, and when planted, placed for a time in a cold pit, so as to be slowly excited into vegetation.

## BABIANA.

The same treatment recommended for the last, will equally suit this genus. Both of them, including also the genus *Ixia*, *Gladiolus*, *Lapeyrousia*, *Sparaxis*, and some other Cape sorts, will succeed when planted out in a turf pit, or even in a moderately dry, warm border in the open air.

## CYRTANTHUS.

This genus is often, like some others of which notice will be taken, very much injured by being always kept in a stove heat, and also by every means being taken to keep them in a constant state of excitement, when the very reverse ought to be the case. Instead of the great heat in which this

genus is in general kept, it has been found to flower much better when planted in the open borders of an ordinary garden. A soil composed of light, sandy loam, peat, and leaf-mould, has been found to answer every expectation. During their season of rest, the roots must be kept dry in the pots, but not taken out of them. When they are just beginning to grow, shake them out of the old ball of mould, and re-pot them, when they will be found to flower in great perfection. While growing, and particularly while in flower, they should have plenty of water. They are increased both by offsets and seeds, which, in well-grown plants, are produced in abundance.

Of the culture of this genus, Mr. Herbert says, that it is altogether difficult, the bulbs being more disposed to dwindle and rot, than to increase in bulk. A common greenhouse, he says, is too damp for it in winter, and the air of a stove too confined. On Mr. Herbert's authority, we are informed, that Mr. Griffin cultivated *C. obliquus* very successfully by keeping the bulbs on a shelf very near the glass in his stove, where the heat was never great. "A light soil," says Mr. Herbert, "which is not retentive of water, will be found to suit the whole genus; and [he thinks] that the use of peat will always be dangerous to them. Those with persistent leaves should be cautiously watered in winter, the deciduous species not at all. *C. carneus* is one of the most difficult to manage: I lost it twice," says Mr. Herbert, "notwithstanding the greatest care, and have at last succeeded in establishing one with better hopes, by giving it water very seldom the first year, and rather more after it had formed a strong leaf, keeping it as much as possible in a draft of air in the greenhouse. It is planted in a mixture of white sand, with a little light loam, with an open drain under. With respect to the other species, there is some peculiarity in the soil congenial to them, which is very difficult to analyze."

In the soil of Mitcham common, which is a light brown earth, with a little admixture of dead furze leaves, on a gravelly substratum, they grew admirably, while the soils to which he had afterwards access in Yorkshire, were altogether unsuitable to them. He concludes that light soils are less favourable to this family than those that are more disposed to set firm, and not fall to pieces when turned out of the pot, and that good drainage and cautious watering should be strictly attended to.

#### EUCOMIS.

This is a very hardy genus of bulbs, although not unfrequently found placed in the stove. It stands the most severe winters we have had of

late years, with impunity, when planted in a warm and dry border. It is increased by offsets, which are produced in abundance. We believe it rarely seeds.

GALAXIA, LAPEYROUSIA, AND BRODIÆA,

All succeed in a light, turfy, rather rich soil. They should be planted in large pots, and not more than two or three bulbs, at the most, placed in each. They require water regularly while in a growing state, but comparatively little compared to the foregoing genera. They should be placed near the glass, and in a situation where the fullest ventilation can be admitted to them. Indeed, they succeed better in a warm border, or turf-pit, than they do under the ordinary mode of management, by which they are one day deluged in water, and for several others are kept quite dry. Such extremes are bad for any plants: but for the more slender and weak-growing bulbs it is certain destruction, for the foliage is prevented from attaining its full perfection, and without that be fully developed, no flowers need be looked for, and in the course of a year or two the bulbs will cease to exist.

IXIA AND GLADIOLUS.

These two charming genera of Cape bulbs deserve to be much more generally cultivated than they are at present. They breed freely by offset bulbs, are very hardy, and even succeed when planted in a warm border in the open air. Some species produce seeds, from which plants may be obtained; but unless the process of artificial fecundation has taken place, and the expectation of hybrid varieties be the object in view, we should say that it was not worth the trouble of originating from seeds, plants that propagate so freely by the root. Seedling plants would require the cultivation of three or four years to bring them to a flowering state, while young offset bulbs will flower, in many cases, the year following. In planting both these genera, if planted in pots for house culture, they should be set very shallow in the mould. When the season of flowering is past, and the bulbs ripe, they should be taken out of the pots and kept dry in paper bags, or drawers, until the season of planting again returns. The bulbs at this time should also be arranged; the larger and full-grown ones set apart for flowering, and the smaller ones kept to be planted in store pots, or in nursery beds, until they attain their full size.

## OXALIS.

This very interesting genus is equally hardy with the last, and will succeed as well in the greenhouse, plant pit, or out of doors in a favourable situation. They are rapidly increased by offset bulbs; and for this reason should be taken out of the mould every season when the foliage has died down, for the purpose of being separated; for if the smaller roots be not removed from the full-grown ones, the latter will not flower freely.

This genus flowers, when kept in the house, at an early period of the year, and is therefore a very fitting inhabitant of the bulb house, where they should occupy, with *Ixia* and other low-growing kinds, the front platforms, so that they may be near the light, exposed to the sun, and at the same time near the eye of the observer. They delight in a light, rich soil.

## LACHENALIA.

This genus is very often, although improperly, placed in a stove temperature. It succeeds better in a more moderate heat, and indeed will flower well in a close pit or warm frame. It increases by offset bulbs freely, delights in a light, rich soil, and should remain all the year in the pots; but these should be kept perfectly dry during the dormant season, that is, from the time the leaves begin to fade, until they begin to appear again in spring.

## MASSONIA.

This is rather a delicate Cape genus. They should be planted in small pots, in light, turfy soil, not over rich, and placed upon a dry, airy shelf, near to the glass. They do not, at any period of their growth, require much water; but during their dormant period should be kept quite dry.

## MORÆA.

This is a genus not much cultivated: however, it deserves the attention of the flower gardener as a greenhouse plant. Its culture is similar to the last, only it is by no means so tender, nor so impatient of water.

## POLYANTHUS.

This is the well-known and fragrant tuberose ; a plant, it appears, cultivated since 1629. It is seldom that its culture succeeds with us so as to exist for many years ; but the loss is the less, as we have an annual supply of roots imported from the south of Europe, and the warmer parts of North America, where the climate is better suited to it than the artificial one of our gardens.

The tuberose was cultivated very successfully for many years in the open air of this country, among others, by the late Mr. Salisbury, who has detailed his practice in a very excellent communication to the Hort. Soc., and published in their Transactions, Vol. I. p. 53 ; the rationale of which is (and that is equally applicable to its culture under glass,) “to obtain a sufficient degree of heat during summer, to bring their leaves out to the full magnitude, that of the roots following of course.” He also recommends that the roots be kept growing as vigorously as possible from May to October, but in a state of complete rest and drought for the remainder of the year.

The usual mode of flowering this plant is, after procuring strong bulbs, to pot them in March or April, in rich, turfy loam, and to place them in a pit, or frame, in a strong humid heat, where they are kept, till they how the flower stems, after which they are placed in the hot house to perfect their flowers. But another, and much better mode, is to excite them in a moderate temperature in a pit, or frame, and when their flower stems appear, to remove them to a cool greenhouse, or bulb house, when they will flower in perfection, and, from being in a low temperature, will last much longer in bloom than if placed in a plant stove. The tuberose is one of the few plants that will accommodate itself to a long absence from fresh air, and an excess of light ; and hence, we find it last in flower, giving out its delightful perfume for a long period when kept in close rooms, halls, and similar situations.

## CYCLAMEN.

The roots or bulbs should be placed *on*, not *in*, the mould ; for all the species of this genus, *C. coum* excepted, which prefers a peaty soil, the mould should consist of equal parts of sandy loam, leaf-mould, and very rotten cow-dung ; the pots should be well drained, and not much larger than about twice the diameter of the bulb. They should be placed in a

light airy part of the bulb house, or cold pit, where they are merely protected from frost ; for were they kept in a dark, cool, damp place, they would never flower, and the more valuable, such as *C. repandum*, would soon perish. About the month of June, the leaves die down ; the bulbs should then be placed in a close, dry pit, and kept without water till August, at which period they should be shaken out of the pots and rotted into fresh mould.

On the culture of *Cyclamen persicum*, Mr. John Wilmot offers the following remarks :—" As this plant blossoms early, I would advise assisting it with a little heat. Select a few pots, and place them in the stove in the beginning of February : they will soon show their blossom : remove them by degrees to their old quarter, the greenhouse, and select only those plants that are scented, some being much more so than others, [a fact, we believe, not generally known ;] they will soon form their seed vessels, if assisted with plenty of air, and when you find the seed sufficiently ripe, sow it immediately in pans. The plants will appear in the autumn : let them remain in the greenhouse till the beginning of May ; and, in removing the plants from the pans, you will find they have formed bulbs about the size of a pea, and some as large as a hazel nut. Prepare a bed for their reception, by digging and raking the soil to a fine mould, and cover the same over with about two inches of sifted loam, leaf-mould, or rotten dung, with a mixture of sandy peat. Plant the bulbs about six inches apart from each other, and let them be kept covered, either with hand glasses, or with hot-bed sashes, to protect them from the cold, and probable frosty nights, and in the day time admit what air is required, according to the state of the weather. About the middle of summer, when you apprehend no danger from frosty nights, the glasses may be taken away, as the plants will require no farther care than sufficiently watering them, if the season proves a dry one, as often as occasion may require.

" At the time you remove the greenhouse plants into the house, let the *Cyclamen* be taken carefully up and potted, one bulb in a small pot. Fit the pot to the size of the plant, and be careful not to place a small plant in a large pot. The pot No. 60, for small ones, and No. 48, for the larger, will be sufficient ; and if a fine growing summer succeeds, some of the bulbs will be two inches in diameter, and produce as much blossom as a plant two years old by the drying system. By this mode of cultivation, a stock of that beautiful plant can easily be raised, and as time can be saved in the cultivation, without any additional expense or trouble, I trust I shall, in a short time, see it growing generally with that luxuriance

which I have often observed with pleasure in my garden, where I have frequently counted from fifty to eighty fine, strong, expanded blossoms, from a bulb two years old, growing in a forty-eight sized pot."—*Gard. Mag.*, Vol. I., p. 387.

## WACHENDORFIA.

This genus is nearly hardy enough to withstand our ordinary winters in the open borders. It is readily propagated by offsets, and succeeds in any ordinary good soil. When cultivated in pots, they should be large, for the roots are numerous, and occupy a considerable space.

## GRIFFINIA.

This splendid genus has been hitherto considered both rare and difficult to flower. We suspect that the real cause is, that it is treated like many other bulbs, which, because they do not flower annually, and under all circumstances of ordinary culture, are neglected and set by on shelves and out-of-the-way places, where they have no opportunity of developing their foliage, without which, as we have already repeatedly observed, no bulb can or will flower, nor will many of them long exist. In a soil composed of light, rich, turfy loam, the pots well drained, the bulbs not set too deep in the mould, and then placed in a situation where it can enjoy abundance of light, air, and sunshine, and at the same time regularly watered, but not to excess, the foliage of *Griffinia* will attain its full magnitude, and this once being the case, flowers will follow, as a matter of course.

## VALLOTA, ZEPHYRANTHUS, AND NERINE,

Have been separated by botanists from the original genus *Amaryllis*; the same mode of treatment is applicable to the majority of them. The culture of the Guernsey lily, *Nerine sarniensis*, in some respects differs from these. It is well known that they are successfully cultivated in the open air in the island from whence their name is derived, but how they found their way thither, from Japan, of which they are natives, is not so easily determined; be that as it may, we receive an abundant supply of their

bulbs annually from that island, and they arrive in general during the months of July and August, with the flower stems more or less advanced. When they are received, they should be immediately potted in thirty-two sized pots, in light, rich, turfy soil, and placed in a frame pit, or in front of a greenhouse, or the front platform of the bulb house, that they may enjoy plenty of light, air, and sunshine, which will improve the colour of the flowers greatly. If they be placed remote from the light, the flowers will be of a very pale colour; but if brought more forward, they will attain their beautiful and deep pink colour, for which they are so deservedly admired. Water should be given moderately and regularly, and by such treatment they will continue in bloom till October or later. It is seldom that cultivators take the trouble to keep these bulbs beyond the period of flowering: some, however, have done so, and have produced flowers for several successive years. The following routine is recommended by a correspondent in the *Horticultural Register*, Vol. I., p. 695.

"After the flowers have decayed, the green leaves will begin to shoot; and as on the perfection of the growth of these the future flowering of every bulb depends, it will be necessary to render them every possible assistance, and not, as is generally the case, thrust them under the stage in the greenhouse, stove, or any other place where they will be out of sight. The best method I know, is to make a hot-bed, and after having set on a frame, lay over the dung about a foot thick of the same compost they were potted in, then turn out each pot of bulbs with the ball perfect, for if these are broken, their growth will be much retarded. Shelter them from the severity of winter, and give them water and air as they require it, until the bulbs are ripe, then keep the soil perfectly dry. By this treatment, many will bloom the second year with great vigour. As soon as the flower stems begin to show, take them up with a trowel so as not to injure the small fibres that are starting, and pot them, being careful to remove none but those showing flowers. If they were allowed to stand on the bed for two years, and could be kept warm through the second winter, they would bloom finer than those that are imported."

The observations of Thomas Andrews Knight, Esq. on this subject, are so replete with sound sense and excellent practical directions, that we are disposed to give them at length, particularly as they do not entirely refer to the Guernsey lily in particular, but to the majority of bulbous-rooted plants flowering in the same manner and at the same season.

"Bulbous roots increase in size, and proceed in acquiring powers to produce blossoms, only during the periods in which they have leaves, and in which such leaves are exposed to light; and these organs always operate



most efficiently when they are young, and have just attained their full growth. The bulb of the Guernsey lily, as is usually cultivated in this country, rarely produces leaves till September, or the beginning of October, at which period the quantity of light afforded by our climate is probably quite insufficient for a plant, which is said to be a native of the warm and bright climate of Japan; and before the return of spring, its leaves are necessarily full grown, and nearly out of office, even when they have been safely protected from frost during the winter. Is it, therefore, not extraordinary, that a bulb of this species, which has once expended itself in producing flowers, should but very slowly recover the power of blossoming again? Considering, therefore, the deficiency of light and heat, owing to the late period of its vegetation, as the chief cause why this plant so often fails to produce flowers, I inferred, that nothing more would be required to make it blossom as freely, at least, as it does in Guernsey, than such a slight degree of artificial heat applied early in summer, as would prove sufficient to make the bulbs vegetate a few weeks earlier than usual in the autumn. Early in the summer of 1816, a bulb which had blossomed in the preceding autumn was subjected to such a degree of artificial heat, as occasioned it to vegetate six weeks, or more, earlier than it would otherwise have done. It did not, of course, produce any flowers; but in the following season it blossomed early and strongly, and afforded two offsets; these were put into pots in the spring of 1818, containing about one-eighth of a square foot of light, rich mould, and were fed with manured water, and the period of their vegetation was again accelerated by artificial heat. Their leaves, consequently, grew yellow from maturity early in the present spring, when the pots were placed in a rather shaded situation near a north wall, to afford me an opportunity of observing to what extent, in such a situation, the early production of the leaves, in the preceding season, had changed the habit of the plant. I entertained no doubt but that both the bulbs would produce blossoms, but I was much gratified by the appearance of the blossoms in the first week in July. From the success of the preceding experiment, I conclude, that if the offsets, and probably the bulbs of this plant which had produced flowers, be placed in a moderate hot-bed in the end of May, to occasion the early production of their leaves, blossoms would be constantly afforded in the following season; but it will be expedient to habituate the leaves thus produced gradually to the open air, as soon as they are nearly fully grown, and to protect them from frost till the approach of spring."

The whole routine of culture required for the genus *Nerine*, may be conveyed in the following rules:—Encourage a vigorous growth of leaf

during the autumn ; the requisites being, warmth enough to excite them, and ventilation sufficient to prevent their being drawn up weak. During the winter, their foliage must be protected against frost and drouth. About May they should be gradually ripened, by withholding water from them ; and in August or the beginning of September, their growth should be promoted by its application. *N. lucida* appears to differ from the rest, by continuing to grow all the year.

#### BRUNSVIGIA.

In this genus, we have another instance of the absurdity of keeping such plants in the stove temperature ; and, as a consequence, it is seldom they produce their bloom,—at least, the most splendid of the genus. The soil they seem to prefer, is a rich, light, turfy loam, with a mixture of peat, sand, and completely decomposed dung. As the roots of the bulbs grow to a large size, it is proper that they should have large pots, because large bulbs always send down numerous strong roots to collect sufficient food for the flowers and foliage. Some cultivators, in planting this genus, make a hole in the mould, into which they lay a little white sand, on which the bulb is to be set, and also round its sides, to keep it from coming in contact with the mould ; but this we think is superfluous ; we would rather plant the bulb high, that is, set it almost on the surface of the mould, for they are often injured by being too deeply planted. Give little water at first, but after vegetation has commenced, water should be given in great abundance, and continued while the foliage is making, and while the plants are in flower. After that period, they must be kept dry till the returning season. It is better to keep the bulbs of this genus in the pots during the season of rest, than to take them out, and the best situation for them during that period will be under the platform, recommended in the early part of this article.

#### HÆMANTHUS.

This is a very showy genus when in flower, a state in which they are seldom seen, principally in consequence of being kept in a continual stove heat. Few bulbous-rooted plants are more hardy, requiring only the temperature of a pit, frame, or ordinary greenhouse. It appears that of this genus the species *rotundifolius*, *maculatus*, *pumilio*, *hyalocarpus*, and

*carneus*, prefer a light, sandy soil, mixed with peat, whereas the species *orbicularis*, *crassipes*, and some others, prefer a strong loamy soil. They require a moderate supply of water while growing, but during their season of rest they should be kept dry, but not taken out of the pots until the season approaches, when they are beginning to grow, when they, like all other bulbs, must be re-potted into fresh mould. *H. multiflorus* is an exception to the above rule, for it requires a strong heat to flower it well.

## ALSTRÆMERIA.

This splendid genus, chiefly natives of Chili, will all thrive and flower in the fullest perfection in a warm, sheltered border in the open air. Their singularity of form and beauty of colouring, however, demand for them a place in the bulb house, which is the most suitable for their culture, as they associate better in appearance with bulbous-rooted plants than with any other.

A rich, light, loamy soil is the most proper for them; and when cultivated in pots they should be of large dimensions, as their roots are numerous, large, and very impatient of restraint. Most of them ripen seeds freely, from which abundance of young plants can be obtained; but the most ready and expeditious mode of multiplying them, is by dividing the roots when potted or planted out in spring. The older species of this genus, viz., *A. ligtu* and *pelegrina*, were long considered shy-flowering plants; the reason was, they were treated as stove plants, and the too frequent error fallen into of keeping them constantly in a state of excitement. All plants of this genus, like bulbous-rooted plants in general, should have a period of rest, and that commences when the foliage has been fully developed, the flowers faded, and the seeds matured: at which time water should be gradually withheld, and during the period of their repose they should be kept quite dry.

This family are chiefly natives of Alpine situations, consequently they require to be cultivated in an airy, dry situation, and where the roots can be protected from severe frost during winter. During the season of their growth, they can hardly be too liberally supplied with water, but while in an inactive state, are to be kept quite dry. The whole of our collection, amounting to thirteen species and varieties, have flowered most abundantly and splendidly, planted in a narrow border in front of a plant stove, and some duplicate plants have even flowered in the borders in the open garden: the only protection they had during the winter of 1836-7, when the

thermometer indicated twelve degrees of frost, was a thin covering of moss and dry fern laid over them. They require to be examined in spring, as slugs are apt to attack them, and if not prevented or removed, would soon devour them. This evil can always be easily guarded against, either by watering the bed with lime water occasionally, or by picking them off when they appear.

The tubers should be planted rather deep than otherwise, which is both a protection against excessive drought as well as severe frost. The Hon. and Rev. William Herbert found it advantageous to cover the bed in spring with saw dust, which the slugs do not like to crawl over, and also because it keeps the mould much moister by lessening evaporation. A top covering of peat, the same learned and zealous cultivator observes, is also disagreeable to slugs; but we have not made the same observation.

This splendid genus affords a fine field for the operation of artificial fecundation, and we apprehend that many beautiful and interesting varieties may yet be originated by that means. Professor Poepig mentions having found *A. hæmantha* growing promiscuously, of every shade of vermillion, orange, yellow, sulphur, and white, which Mr. Herbert apprehends to have been hybrid varieties naturally originated between the vermillion and white varieties, which are mentioned by the traveller Ruiz; these latter being growing near together, the other varieties are their united offspring. "I do not believe," says Mr. Herbert, "that we shall be able to produce the same result, even by garden cultivation and sowing the seed of the vermillion plant, without first obtaining a white variety to cross with the vermillion. The known variability of the genus, however, the *white pelegrina* and the beautiful two-coloured variety of *pulchra*, which have been raised in England, affords a great encouragement to cultivators." To those interested in the production of hybrids, the following remark of that great and good man, Mr. Herbert, will be instructive. "It is very remarkable, that the stigma of *Alstræmeria* does not come to perfection till after the decay of its anthers. The stamens advance successively, like those of *Nerine undulata*, and like them nod before they rise, the petaline filaments taking the lead, but the two upper ones not simultaneously with the lower. It results from this, that the stigma must either be fertilized by the pollen of another flower, or that its own scattered pollen must be efficient, after it seems dried up and lost; in either case, there is a greater probability of the intrusion of the pollen of another individual, than when the stigma and anthers are mature at the same time."

"The variation in the form and colour of the flower of *A. pulchra*, and

the two-coloured varieties, as well as the seedlings of *A. Cummingiana* from imported seeds, should render botanists very cautious not to multiply species too freely, on the appearance of such diversities in natural specimens from different localities, which makes it very difficult to fix on the true distinguishing features."

In this opinion we most cordially agree with the above high authority; and only wonder how some botanists have been led astray, in establishing, as species, what, in reality, are only varieties. The day is probably not far distant when all specific distinctions will be entirely exploded. The system of giving a Latin specific name to hybrid varieties is also much to be reprobated. This system has unfortunately, to a certain extent, been followed by M. de Candolle, and most extensively employed by the late Mr. Sweet, much to the confusion of science, and tending greatly, in our opinion, to bring scientific botanical nomenclature and arrangement into contempt, rather than the reverse. We might as well dignify with scientific names, every variety of dahlia, pink, or tulip, as some of the hybrid *Alstræmeria*, *Amaryllis*, *Calceolaria*;—florist's names, where they are not coarse and vulgar, are much more fitting.

In continuation of the above quotation, Mr. Herbert adds,—“Little attention is to be paid to the length of the style in *Alstræmeria*; its maturity is very tardy: it is very short at first, grows out slowly, and at last the stigma, which had appeared to be simple, expands and becomes trifid and patent. The anthers discharge their pollen long before the maturity of the style. The late development of the stigma should make the genus very liable to spontaneous intermixtures of the species, but render it difficult to obtain artificial crosses. I failed in getting seed at all from an attempt to fertilize the *red pelegrina* by the *white*, which must have arisen from having neglected the proper moment for fertilizing the style, or for selecting the pollen.”

#### TROPÆOLUM.

The perennial species of this genus require the same treatment as the last. Being climbing plants of very slender habits, it is well to place in each pot a branch of some deciduous tree for them to be trained to. We cannot admire the common-place manner in which they are trained to wire frames, which always gives them a stiff and formal appearance, and is both more expensive and troublesome than by allowing them to ramble in a natural manner up the small twigs of a properly selected branch.

The species of *Crinum* and *Pancratium* are both extensive and very desirable as fine-flowering and fragrant plants. Their culture is much less difficult than that of many other bulbs, but like them they are often injured by being kept in a constant state of excitement. During the period of making their leaves and producing their flowers, they require to be liberally supplied with water, but when the one fades and the other is fully formed, water should be gradually withheld from them. The following judicious remarks on the genus *Crinum* by Mr. Sansome, in the Floricultural Cabinet, is applicable to both.

"The greater part of this genus, being inhabitants of hot countries, require the stove in order to their success, and a liberal supply of water during the summer months; but during winter, the quantity of moisture should always be diminished, otherwise many of the bulbs will perish. I find, however, those with columnar stems do not object to plenty of moisture at all times as the habit of their leaves is more decidedly perennial; but it is by far the best, at all times, to rather underwater than overwater, and particularly those varieties which are of tender growth.

"The compost I find best for *Crinums* generally, is a rich, yellow loam, rather of a friable texture; many cultivators of *Crinums* use peat in the composts, but I consider it very prejudicial; plenty of drainage in the pots I consider very essential, so that the plants may often receive the proper nourishment of fresh water—the size of the pot depends on the habit of the bulb—but in order to bloom them well, they require plenty of pot room when in a healthy state. Whenever the youngest leaves of any *Crinum* with a perennial bulb, turn yellow and decay, the bulb should be allowed to go to rest for a short period; too much moisture, in too low a temperature, will often produce this effect. In potting, the whole of the column should be kept above the soil, and all the obsolete coats, which are the base of the decayed leaves, should be gradually stripped away, leaving the bulbous stem smooth and clean. I find nearly the whole genus to succeed the best when plunged up to the rim of the pots in troughs of sand, which are fixed over the flues; and during very hot weather, I find it essential to inundate the troughs, but not to keep them constantly flooded. Some of the species, at the approach of winter, will require the pots to be turned on their sides, and to be kept perfectly dry. As soon as the plant has ceased to vegetate, shake the earth carefully from the bulb, pull off the decayed coats without making the bulb bleed, and re-pot it in dry pulverized loam, and let no water be given till the spring. My minimum heat is sixty five degrees of Fahrenheit, and maximum, from eighty to ninety degrees."

## PHYCELLA.

This genus is found indigenous in a strong sandy soil, upon a dry rocky substratum; they flourish best, therefore, in a soil of the same description, and by having the pots in which they grow well drained. Peaty soil appears to be very inimical to them, and Mr. Herbert attributes to the attempts to grow them in that soil, and to the generally received opinion that the genus is difficult to cultivate, the circumstance of their being seldom found in perfection. They will flower well if planted in a warm border in the open air, but are apt to vegetate during winter, should it be at all mild, and therefore are very liable to be injured by frosts that may ensue, as it is their habit to flower after the foliage has attained its full size, and before they go into a state of rest. Their season of rest (during which period they should be kept perfectly dry) continues from the time the foliage begins to wither, which usually occurs in August, till the bulbs begin to send out young fibres, indications of returning vegetation usually observed about February, but which will be readily discovered, as the bulbs should be kept in sand, in a box or drawer. A period of about six months should be allowed for them to rest.

## HABRANTHUS.

This genus flowers before the production of its leaves, which begin to develop themselves in autumn, and continue to grow through the winter. Great care ought to be taken that they sustain no check during their growth; for, as it has been already observed, upon the full maturation of the foliage of the bulbs chiefly depends the production of flowers. From this circumstance it will appear, that the genus is not well adapted to the open border culture, so well suited to many other genera of Bulbous-rooted plants.

"When cultivated in a border," says Mr. Herbert, "they should be covered with a glass frame, to keep them hot and dry, in May, June, and July, and any covering of mats or straw, that will prevent injury from severe frost, may be sufficient for winter; or they may be taken up when the leaves decay, without breaking the fibres, kept in sand, and re-set three months after."

## ISMENE.

The whole of this beautiful genus require absolute rest during winter, and delight in a light sandy soil, at least to have fine white sand placed

round the bulb. They will flower in the open border, if planted in April in a light compost; but the bulbs must be taken up in October or November before being injured by frost, and kept dry till the season of planting returns. A singular circumstance is recorded by Mr. Herbert of this family, viz., that the seed, which is large and round, vegetates immediately after it is sown, in a remarkable manner, forming a bulb as big as itself (sometimes much bigger) far under ground, without pushing any leaf. As soon as the seeds rot, the young bulb should be left without water until next spring. A person not aware of this peculiarity of the genus, when he found the seed rotten, would be likely to throw away the earth without suspecting the formation of the bulb near the bottom of the pot. If the seedling of "*Ismene Amancaes* be grown in loam," says the same high authority, "I believe they would be twenty years before they attain a size to flower; in pure white sand, or any sandy compost, I think they may flower the third."

#### AMMOCHARIS.

This genus requires a rich, rather strong soil, and to be abundantly supplied with water in summer, but during winter, their season of rest, they should be kept perfectly dry. To flower them in full perfection, the pots should be plunged in a hot-bed, carefully shading the plants from the scorching sun, which if not attended to would destroy the foliage.



## SELECT LIST OF BULBS.

## WHITE.

- Pubescent Blood-flower. (*Hæmanthus pubescens*.) Flowers in August, in rich mould. Offsets.
- White-flowered Blood-flower. (*Hæmanthus albidiflos*.) Flowers in April and August, in rich mould. Offsets.
- Narrow-leaved Crinum. (*Crinum angustifolium*.) Flowers in June and July, in loam and peat. Offsets.
- Plaited Crinum. (*Crinum plicatum*.) Flowers in June and August, in rich mould. Offsets.
- Carey's Crinum. (*Crinum Careyanum*.) Flowers in July, in rich mould. Offsets.
- Short-stamined Crinum. (*Crinum brachyandrum*.) Flowers in June and August, in rich mould. Offsets.
- Declined Crinum. (*Crinum declinatum*.) Flowers in May, in rich mould. Offsets.
- Revolute Crinum. (*Crinum revolutum*.) Flowers in June, in rich mould. Offsets.
- American Crinum. (*Crinum Americanum*.) Flowers in July and August, in rich mould. Offsets.
- Pleasing Crinum. (*Crinum amœnum*.) Flowers in July and August, in rich mould. Offsets.
- Many-flowered Crinum. (*Crinum multiflorum*.) Flowers in July and August, in rich mould. Offsets.
- Virgin Wood-sorrel. (*Oxalis virginea*.) Flowers in January and August, in sand and peat. Offsets.
- Pretty Cape Wood-sorrel. (*Oxalis lepida*.) Flowers in January and November, in sand and peat. Offsets.
- Pretty Wood-sorrel. (*Oxalis pulchella*.) Flowers in October and November, in sand and peat. Offsets.
- Woolly-leaved Wood-sorrel. (*Oxalis lanata*.) Flowers in October and November, in sand and peat. Offsets.
- Downy-leaved Wood-sorrel. (*Oxalis tomentosa*.) Flowers in April and May, in sand and peat.
- Wedge-leaved Wood-sorrel. (*Oxalis cuneifolia*.) Flowers in April and May, in sand and peat. Offsets.
- Graceful Crinum. (*Crinum venustum*.) Flowers in July and August, in rich mould. Offsets.
- Elegant Crinum. (*Crinum elegans*.) Flowers in September, in rich mould. Offsets.
- Long-peduncled Crinum. (*Crinum pedunculatum*.) Flowers in July and August, in rich mould. Offsets.
- Narrow-leaved Crinum. (*Crinum angustifolium*.) Flowers in June and July, in loam and peat. Offsets.
- Sumatra Crinum. (*Crinum Sumatranum*.) Flowers in July and August, in rich mould. Offsets.
- Crowded Crinum. (*Crinum confertum*.) Flowers in June, in rich mould. Offsets.
- Tall Crinum. (*Crinum procerum*.) Flowers in July and August, in rich mould. Offsets.
- Clavate Gastronema. (*Gastronema clavatum*.) Flowers in May and June, in rich mould. Offsets.
- Plantain Watsonia. (*Watsonia plantaginea*.) Flowers in June and July, in sandy peat and loam. Offsets.
- Fasciculate Lapeyrousia. (*Lapeyrousia fasciculata*.) Flowers in May and June, in sandy peat and loam. Offsets.
- Eatable Gladiolus. (*Gladiolus edulis*.) Flowers in May and June, in sandy peat and loam. Offsets.
- Linear Ixia. (*Ixia linearis*.) Flowers in April and May, in sandy peat and loam. Offsets.
- White-flowered Ixia. (*Ixia leucantha*.) Flowers in May, in sandy peat and loam. Offsets.
- Spurious Ixia. (*Ixia hybrida*.) Flowers in April and May, in sandy peat and loam. Offsets.

Upright Ixia. (*Ixia erecta*.) Flowers in May and June, in sandy peat and loam. Offsets.

Anemone-flowered Sparaxis. (*Sparaxis anemoniflora*.) Flowers in May and July, in sandy peat and loam. Offsets.

Cape Tritonia. (*Tritonia Capensis*.) Flowers in August and October, in sandy peat and loam. Offsets.

Long-flowered Tritonia. (*Tritonia longiflora*.) Flowers in April and June, in sandy peat and loam. Offsets.

Pale-flowered Tritonia. (*Tritonia pallida*.) Flowers in August, in sandy peat and loam. Offsets.

Whitish Gladiolus. (*Gladiolus albidus*.) Flowers in May and June, in sandy peat and loam. Offsets.

## RED.

Scarlet Blood-flower. (*Hæmanthus coccineus*.) Flowers in August and October, in rich mould. Offsets.

Thick-petioled Blood-flower. (*Hæmanthus crassipes*.) Flowers in June and July, in loam. Offsets.

Glass-fruited Blood-flower. (*Hæmanthus hyalocarpus*.) Flowers in July, in sandy loam and peat. Offsets.

Spear-leaved Blood-flower. (*Hæmanthus lanceafolius*.) Flowers in September and October, in rich mould. Offsets.

Musk-scented Blood-flower. (*Hæmanthus moschatus*.) Flowers in August and September, in rich mould. Offsets.

Many-flowered Brunsvigia. (*Brunsvigia multiflora*.) Flowers in June and August, in rich mould. Offsets.

Sickle-leaved Brunsvigia. (*Brunsvigia falcata*.) Flowers in May and June, in rich mould. Offsets.

Rasp-leaved Brunsvigia. (*Brunsvigia radula*.) Flowers in April and August, in rich mould. Offsets.

Guernsey Lily. (*Nerine Sarniensis*.) Flowers in September and October, in rich mould. Offsets.

Anderson's Amaryllis. (*Amaryllis Andersoni*.) Flowers in rich mould. Offsets.

Glaucous Amaryllis. (*Amaryllis glaucescens*.) Flowers in June and October, in rich mould. Offsets.

Long-flowered Amaryllis. (*Amaryllis macrantha*.) Flowers in June and October, in rich mould. Offsets.

Short-flowered Amaryllis. (*Amaryllis breviflora*.) Flowers in June and October, in rich mould. Offsets.

Dark-red Amaryllis. (*Amaryllis atropurpurea*.) Flowers in May and June, in rich mould. Offsets.

Rubescens Amaryllis. (*Amaryllis rubescens*.) Flowers in April and May, in rich mould. Offsets.

Pleasing Amaryllis. (*Amaryllis amœna*.) Flowers nearly all the year, in rich mould. Offsets.

Colvill's Amaryllis. (*Amaryllis Col-*

villi.) Flowers in June and July, in rich mould. Offsets.

Bracted Amaryllis. (*Amaryllis bracteata*.) Flowers nearly all the year, in rich mould. Offsets.

Reddish Amaryllis. (*Amaryllis rubicunda*.) Flowers in May and July, in rich mould. Offsets.

Compact Amaryllis. (*Amaryllis compacta*.) Flowers nearly all the year, in rich mould. Offsets.

Recurved-flowered Amaryllis. (*Amaryllis recurviflora*.) Flowers in June and October, in rich mould. Offsets.

Narrow Habranthus. (*Habranthus angustus*.) Flowers in September, in peat and loam. Offsets.

Robust Habranthus. (*Habranthus robustus*.) Flowers in June and July, in rich mould. Offsets.

Rosy Wood-sorrel. (*Oxalis rosea*.) Flowers in September and November, in sand and peat. Offsets.

Bundle-flowered Wood-sorrel. (*Oxalis floribunda*.) Flowers in June and August, in sand and peat. Division of roots.

Fork-leaved Wood-sorrel. (*Oxalis furcata*.) Flowers in September, in sand and peat. Offsets.

Pretty Ixia. (*Ixia amœna*.) Flowers in April and May, in sandy peat and loam. Offsets.

Monadelphus Trichonema. (*Trichonema monadelphum*.) Flowers in July and August, in sandy peat and loam. Offsets.

Blush Trichonema. (*Trichonema pudicum*.) Flowers in August, in sandy peat and loam. Offsets.

Showy Trichonema. (*Trichonema speciosum*.) Flowers in March and April, in sandy peat and loam. Offsets.

Strict-flowered Watsonia. (*Watsonia strictiflora*.) Flowers in June, in sandy peat and loam. Offsets.

Bright Watsonia. (*Watsonia fulgida*.) Flowers in May, in sandy peat and loam. Offsets.

## PINK.

- Smaller Brunsvigia. (*Brunsvigia minor*.) Flowers in July and August, in sandy loam. Offsets.
- Flexuose Nerine. (*Nerine flexuosa*.) Flowers in September and October, in rich mould. Offsets.
- Wave-flowered Nerine. (*Nerine undulata*.) Flowers in May and June, in rich mould. Offsets.
- Roseate Nerine. (*Nerine rosea*.) Flowers in July, in rich mould. Offsets.
- Pretty Nerine. (*Nerine pulchella*.) Flowers in July, in rich mould. Offsets.
- Thick-leaved Crinum. (*Crinum crassifolium*.) Flowers in September, in rich mould. Offsets.
- Flaccid Crinum. (*Crinum flaccidum*.) Flowers in July and August, in rich mould. Offsets.
- Showy Crinum. (*Crinum speciosum*.) Flowers in July and August, in rich mould. Offsets.
- Noble Crinum. (*Crinum insigne*.) Flowers in November, in rich mould. Offsets.
- Submersed Crinum. (*Crinum submersum*.) Flowers in July, in rich mould. Offsets.
- Broad-leaved Crinum. (*Crinum latifolium*.) Flowers in July and August, in rich mould. Offsets.
- Mauritian Crinum. (*Crinum Mauritium*.) Flowers in March, in rich mould. Offsets.
- Charming Amaryllis. (*Amaryllis blanda*.) Flowers in May and June, in rich mould. Offsets.
- Cousin Amaryllis. (*Amaryllis conobrina*.) Flowers in May and June, in rich mould. Offsets.
- Forbes's Amaryllis. (*Amaryllis Forbesii*.) Flowers in July and August, in rich mould. Offsets.
- Large-flowered Zephyranthes. (*Zephyranthes grandiflora*.) Flowers in May and June, in sandy loam. Offsets.
- Keeled Zephyranthes. (*Zephyranthes carinata*.) Flowers in May and June, in sandy loam. Offsets.
- Two-cleft Habranthus. (*Habranthus bifidus*.) Flowers in June, in sandy loam. Offsets.
- Roseate Alstroemeria. (*Alstroemeria rosea*.) Flowers in June and July, in loam, sand, and peat. Roots.
- Edible Alstroemeria. (*Alstroemeria edulis*.) Flowers in July and August, in rich mould. Division of the roots.
- Pale Alstroemeria. (*Alstroemeria pallida*.) Flowers in September and October, in rich mould. Offsets and seeds.
- Tube-flowered Oxalis. (*Oxalis tubi-*
- flora*.) Flowers in October and November, in sandy peat. Offsets.
- Rose-coloured Wood-sorrel. (*Oxalis rosacea*.) Flowers in September and November, in sand and peat. Offsets.
- Reclining Wood-sorrel. (*Oxalis reclinata*.) Flowers in September and November, in sand and peat. Offsets.
- Five-leaved Wood-sorrel. (*Oxalis pentaphylla*.) Flowers in February and November, in sand and peat. Offsets.
- Courtly Ixia. (*Ixia aulica*.) Flowers in April and May, in sandy peat and loam. Offsets.
- Stained Ixia. (*Ixia fucata*.) Flowers in June and July, in sandy peat and loam.
- Bending-stalked Ixia. (*Ixia flexuosa*.) Flowers in April and May, in sandy peat and loam. Offsets.
- Awned Ixia. (*Ixia aristata*.) Flowers in April and May, in sandy peat and loam. Offsets.
- Rosy Trichonema. (*Trichonema roseum*.) Flowers in July, in sandy peat and loam. Offsets.
- Red and White Sparaxis. (*Sparaxis roseo-alba*.) Flowers in April and May, in sandy peat and loam.
- Rosy Tritonia. (*Tritonia rosea*.) Flowers in June and July, in sandy peat and loam. Offsets.
- Spiked Watsonia. (*Watsonia spicata*.) Flowers in May, in sandy peat and loam. Offsets.
- Red and White Watsonia. (*Watsonia roseo-alba*.) Flowers in July and August, in sandy peat and loam. Offsets.
- Marginated Watsonia. (*Watsonia marginata*.) Flowers in June, in sandy peat and loam. Offsets.
- Short-leaved Watsonia. (*Watsonia brevifolia*.) Flowers in May, in sandy peat and loam. Offsets.
- Short-leaved Gladiolus. (*Gladiolus brevifolius*.) Flowers in June, in sandy peat and loam. Offsets.
- Hairy Gladiolus. (*Gladiolus hirsutus*.) Flowers in April and June, in sandy peat and loam. Offsets.
- Involute Gladiolus. (*Gladiolus involutus*.) Flowers in May and June, in sandy peat and loam. Offsets.
- Dwarf Blood-flower. (*Heemanthus pumilio*.) Flowers in August and September, in rich mould. Offsets.
- Keel-leaved Blood-flower. (*Heemanthus carinatus*.) Flowers in August and September, in rich mould. Offsets.

Amaryllis-like Blood-flower. (*Hæmanthus amaryllloides*.) Flowers in August and September, in rich mould. Offsets.

Flesh-coloured Blood-flower. (*Hæmanthus carneus*.) Flowers in June and July, in rich mould. Offsets.

Pale Cyrtanthus. (*Cyrtanthus pal-*

*lidus*.) Flowers in May and July, in rich mould. Offsets.

Shining Brunsvigia. (*Brunsvigia lucida*.) Flowers in August, in rich mould. Offsets.

Poison-bulb. (*Brunsvigia toxicaria*.) Flowers in September and October, in rich mould. Offsets.

## YELLOW.

Caulescent Trichonema. (*Trichonema caulescens*.) Flowers in June and July, in sandy peat and loam. Offsets.

Sweet-scented Sparaxis. (*Sparaxis fragrans*.) Flowers in May, in sandy peat and loam. Offsets.

Anigozanthus-flowered Tritonia. (*Tritonia Anigozantheflora*.) Flowers in June and July, in sandy peat and loam. Offsets.

Self-coloured Tritonia. (*Tritonia concolor*.) Flowers in April and June, in sandy peat and loam. Offsets.

De la Roche Tritonia. (*Tritonia Rochensis*.) Flowers in August, in sandy peat and loam. Offsets.

Yellow Tritonia. (*Tritonia flava*.) Flowers in February and March, in sandy peat and loam. Offsets.

Refracted Tritonia. (*Tritonia refracta*.) Flowers in May and June, in sandy peat and loam. Offsets.

Tube-flowered Babiana. (*Babiana tubiflora*.) Flowers in June, in sandy peat and loam. Offsets.

Sulphur-flowered Babiana. (*Babiana sulphurea*.) Flowers in May and June, in sandy peat and loam. Offsets.

Self-coloured Gladiolus. (*Gladiolus concolor*.) Flowers in May and June, in sandy peat and loam. Offsets.

Trichonema-leaved Gladiolus. (*Gladiolus trichonemifolius*.) Flowers in May and June, in sandy peat and loam. Offsets.

Golden Nerine. (*Nerine aurea*.) Flowers in August and September, in rich mould. Offsets.

Colchicum-flowered Sternbergia. (*Sternbergia colchiciflora*.) Flowers in August and September, in rich mould. Offsets.

Yellow Sternbergia. (*Sternbergia lutea*.) Flowers in August and September, in rich mould. Offsets.

Small Sternbergia. (*Sternbergia exiguua*.) Flowers in August and September, in rich mould. Offsets.

Perennial Wood-sorrel. (*Oxalis perennans*.) Flowers in May and September, in sandy peat. Offsets.

Silky Wood-sorrel. (*Oxalis sericea*.) Flowers in April and May, in sandy peat. Offsets.

Burmamn's Wood-sorrel. (*Oxalis Burmanni*.) Flowers in October and November, in sandy peat. Offsets.

Drooping Wood-sorrel. (*Oxalis cernua*.) Flowers in February and May, in sandy peat. Offsets.

Lobed Wood-sorrel. (*Oxalis lobata*.) Flowers in October and November, in sandy peat. Offsets.

Spear-leaved Wood-sorrel. (*Oxalis lanceifolia*.) Flowers in October and November, in sandy peat. Offsets.

Bean-leaved Wood-sorrel. (*Oxalis fabaeifolia*.) Flowers in October and November, in sandy peat. Offsets.

Fan-leaved Wood-sorrel. (*Oxalis flabellifolia*.) Flowers in September and November, in sandy peat. Offsets.

Laburnum-leaved Wood-sorrel. (*Oxalis laburnifolia*.) Flowers in September and October, in sandy peat. Offsets.

Bloody-leaved Wood-sorrel. (*Oxalis sanguinea*.) Flowers in October and December, in sandy peat. Offsets.

Yellowish Wood-sorrel. (*Oxalis luteola*.) Flowers in January and September, in sandy peat. Offsets.

Fleshy Wood-sorrel. (*Oxalis carnosa*.) Flowers in April and September, in sandy peat. Offsets.

Lupine-leaved Wood-sorrel. (*Oxalis lupinifolia*.) Flowers in October and November, in sandy peat. Offsets.

## SCARLET.

Round-leaved Blood-flower. (*Hæmanthus rotundifolius*.) Flowers in June and October, in sandy loam and peat. Offsets.

Scarlet Blood-flower. (*Hæmanthus*

*puniceus*.) Flowers in May and September, in rich mould. Offsets.

Low Blood-flower. (*Hæmanthus humilis*.) Flowers in September and November, in rich mould. Offsets.

- Many-flowered Blood-flower. (*Hæmanthus multiflorus*.) Flowers in May and September, in rich mould. Offsets.
- Spiral-leaved Cyrtanthus. (*Cyrtanthus spiralis*.) Flowers in May and August, in rich mould. Offsets.
- Josephine's Brunsvigia. (*Brunsvigia Josephineæ*.) Flowers in July and August, in rich mould. Offsets.
- Red-margined Brunsvigia. (*Brunsvigia marginata*.) Flowers in September and October, in rich mould. Offsets.
- Glittering Nerine. (*Nerine corusca*.) Flowers in July and August, in rich mould. Offsets.
- Beautiful Nerine. (*Nerine venusta*.) Flowers in June and July, in rich mould. Offsets.
- Queen's Amaryllis. (*Amaryllis reginæ*.) Flowers in May and June, in rich mould. Offsets.
- Scarlet Amaryllis. (*Amaryllis coccinea*.) Flowers all the year, in rich mould. Offsets.
- Prince's Amaryllis. (*Amaryllis principis*.) Flowers in June and July, in rich mould. Offsets.
- Stranger Amaryllis. (*Amaryllis advena*.) Flowers in May and June, in rich mould. Offsets.
- Fiery-red Amaryllis. (*Amaryllis rutila*.) Flowers in April and May, in rich mould. Offsets.
- Banded Amaryllis. (*Amaryllis vittata*.) Flowers in April and May, in rich mould. Offsets.
- Shining Amaryllis. (*Amaryllis splendens*.) Flowers in May and June, in rich mould. Offsets.
- Imperial Amaryllis. (*Amaryllis im-*  
*perialis*.) Flowers in June and October, in rich mould. Offsets.
- August Amaryllis. (*Amaryllis augusta*.) Flowers in June and October, in rich mould. Offsets.
- Net-flowered Amaryllis. (*Amaryllis retiflora*.) Flowers in May and July, in rich mould. Offsets.
- Equestrian Amaryllis. (*Amaryllis equestris*.) Flowers in July and October, in rich mould. Offsets.
- Fiery Phycella. (*Phycella ignea*.) Flowers in November, in rich mould. Offsets.
- Glittering Phycella. (*Phycella corusca*.) Flowers in September, in sandy peat and loam. Offsets.
- Purple Vallota. (*Vallota purpurea*.) Flowers in May and June, in peat and sand. Offsets.
- Light Alstroemeria. (*Alstroemeria ligtu*.) Flowers in February and March, in loam, sand, and peat. Roots.
- Hairy-leaved Alstroemeria. (*Alstroemeria pilosa*.) Flowers in October, in rich light mould. Seeds.
- Pretty Alstroemeria. (*Alstroemeria pulchella*.) Flowers in June, in loam, sand, and peat. Roots.
- Aletris-like Watsonia. (*Watsonia aletroides*.) Flowers in May and July, in sandy peat and loam. Offsets.
- Winged-flowered Gladiolus. (*Gladiolus alatus*.) Flowers in May and June, in sandy peat and loam. Offsets.
- Colville's Gladiolus. (*Gladiolus Colvillii*.) Flowers in June and July, in loam and sand. Offsets.
- Ethiopian Antholyza. (*Antholyza Ethiopica*.) Flowers in May and June, in sandy peat and loam. Offsets.

## FLESH-COLOURED.

- Vermilion Amaryllis. (*Amaryllis miniata*.) Flowers in June and July, in rich mould. Offsets.
- Flesh-coloured Ixia. (*Ixia incarnata*.) Flowers in April and May, in sandy peat and loam. Offsets.
- Curled-leaved Tritonia. (*Tritonia crispa*.) Flowers in April and May, in sandy peat and loam. Offsets.
- Iris-leaved Watsonia. (*Watsonia iridifolia*.) Flowers in May, in sand, peat, and loam. Offsets.
- Merian's Watsonia. (*Watsonia Meriana*.) Flowers in May and June, in sandy peat and loam. Offsets.
- Hastate Gladiolus. (*Gladiolus hastatus*.) Flowers in April and May, in sandy peat and loam. Offsets.
- Flesh-coloured Gladiolus. (*Gladiolus*  
*carneus*.) Flowers in May and June, in sandy peat and loam. Offsets.
- Creeping-rooted Wood-sorrel. (*Oxalis reptatrix*.) Flowers in November and December, in sandy peat. Offsets.
- Flesh-coloured Wood-sorrel. (*Oxalis incarnata*.) Flowers in April and June, in sandy peat. Offsets.
- Goat's-foot Wood-sorrel. (*Oxalis caprina*.) Flowers in March and June, in sandy peat. Offsets.
- Livid Wood-sorrel. (*Oxalis livida*.) Flowers in October and November, in sandy peat. Offsets.
- Toothed Wood-sorrel. (*Oxalis dentata*.) Flowers in November and December, in sandy peat. Offsets.

## PURPLE.

- Spreading-flowered Ixia. (*Ixiapatens*.) Flowers in April, in sand, peat, and loam. Offsets.
- Dotted-flowered Watsonia. (*Watsonia punctata*.) Flowers in April and May, in sandy peat and loam. Offsets.
- Thunberg's Babiana. (*Babiana Thunbergii*.) Flowers in April, in sandy peat and loam. Offsets.
- Gaping-flowered Babiana. (*Babiana ringens*.) Flowers in May and June, in sandy peat. Offsets.
- Slender-flowered Babiana. (*Babiana tenuiflora*.) Flowers in May and June, in sandy peat and loam. Offsets.
- Purple Babiana. (*Babiana purpurea*.) Flowers in May and June, in sandy peat. Offsets.
- Curve-leaved Nerine. (*Nerine curvifolia*.) Flowers in May and September, in rich mould. Offsets.
- Lateral-flowered Wood-sorrel. (*Oxalis lateriflora*.) Flowers in March and April, in sandy peat. Offsets.
- Canescent Wood-sorrel. (*Oxalis canescens*.) Flowers in January and September, in sandy peat. Offsets.
- Dotted Wood-sorrel. (*Oxalis punctata*.) Flowers in April and June, in sandy peat. Offsets.
- Purple Wood-sorrel. (*Oxalis purpurea*.) Flowers in October and November, in sandy peat. Offsets.
- Corn-field Gladiolus. (*Gladiolus segetus*.) Flowers in June and July, in sandy peat and loam. Offsets.
- Long-flowered Crinum. (*Crinum longiflorum*.) Flowers in July, in rich mould. Offsets.
- Ruddy Crinum. (*Crinum verecundum*.) Flowers in July and August, in rich mould. Offsets.
- Lovely Crinum. (*Crinum amabile*.) Flowers in June and August, in rich mould. Offsets.
- Netted-veined Amaryllis. (*Amaryllis reticulata*.) Flowers in April and May, in rich mould. Offsets.
- Vallet's Amaryllis. (*Amaryllis Valletii*.) Flowers all the year, in rich mould. Offsets.
- Purpurescient Amaryllis. (*Amaryllis purpurescens*.) Flowers all the year, in rich mould. Offsets.
- Spreading Amaryllis. (*Amaryllis patens*.) Flowers all the year, in rich mould. Offsets.
- Annesley's Amaryllis. (*Amaryllis Annesleyana*.) Flowers in May and July, in rich mould. Offsets.
- Purple Amaryllis. (*Amaryllis purpurea*.) Flowers in May and July, in rich mould. Offsets.
- Campanulate Amaryllis. (*Amaryllis campanulata*.) Flowers in June and October, in rich mould. Offsets.
- Solandra-flowered Amaryllis. (*Amaryllis Solandraeflora*.) Flowers in April, in rich mould. Offsets.

## ORANGE.

- Conical Ixia. (*Ixia conica*.) Flowers in April and May, in sandy peat and loam. Offsets.
- Three-coloured Sparaxis. (*Sparaxis tricolor*.) Flowers in May, in sandy peat and loam. Offsets.
- Saffroned Tritonia. (*Tritonia crocata*.) Flowers in May and June, in sandy peat and loam. Offsets.
- Namaqua Gladiolus. (*Gladiolus namaquensis*.) Flowers in May and June, in sandy peat and loam. Offsets.
- Permeable Gladiolus. (*Gladiolus permeabilis*.) Flowers in May and June, in sandy peat and loam. Offsets.
- Narrow-leaved Cyrtanthus. (*Cyrtanthus angustifolius*.) Flowers in May and June, in rich mould. Offsets.
- Striated Cyrtanthus. (*Cyrtanthus striatus*.) Flowers in July, in rich mould. Offsets.
- Related Amaryllis. (*Amaryllis consanguinea*.) Flowers all the year, in rich mould. Offsets.
- Powdery Amaryllis. (*Amaryllis pulverulenta*.) Flowers in April and May, in rich mould. Offsets.
- Few-flowered Alstrœmeria. (*Alstrœmeria pauciflora*.) Flowers in September, in rich mould. Division of the roots.
- Piotta's Wood-sorrel. (*Oxalis Piottæ*.) Flowers in January and September, in sandy peat. Offsets.
- Very-tall Antholyza. (*Antholyza præ-lata*.) Flowers in January and February, in sandy peat and loam. Offsets.

## BLUE.

- Monadelphous Ixia. (*Ixia monadelpha*.) Flowers in April and May, in sandy peat and loam. Offsets.
- Sky-blue Trichonema. (*Trichonema caelestinum*.) Flowers in March and April, in sandy peat and loam. Offsets.
- Column's Trichonema. (*Trichonema Columnæ*.) Flowers in March and April, in sandy peat and loam. Offsets.
- Striated Tritonia. (*Tritonia striata*.) Flowers in May and June, in sandy peat and loam. Offsets.
- Elder-scented Babiana. (*Babiana sambucina*.) Flowers in April and May, in sandy peat and loam. Offsets.
- Corymbose Lapeyrouisia. (*Lapeyrouisia corymbosa*.) Flowers in May and June, in sandy peat. Offsets.
- Falcate Lapeyrouisia. (*Lapeyrouisia falcata*.) Flowers in May and June, in sandy peat and loam. Offsets.
- Violet-coloured Griffinia. (*Griffinia hyacinthina*.) Flowers in June and September, in rich mould. Offsets.
- Intermediate Griffinia. (*Griffinia intermedia*.) Flowers in March and April, in peat and loam. Offsets.

## VARIEGATED.

- Pillar Ixia. (*Ixia columellaris*.) Flowers in August, in sandy peat and loam. Offsets.
- Lined Tritonia. (*Tritonia lineata*.) Flowers in May, in sandy peat and loam. Offsets.
- Narrow-leaved Babiana. (*Babiana angustifolia*.) Flowers in May and June, in sandy peat and loam. Offsets.
- Various-coloured Nerine. (*Nerine versicolor*.) Flowers in July and October, in rich mould. Offsets.
- Various-coloured Amaryllis. (*Amaryllis versicolor*.) Flowers all the year, in rich mould. Offsets.
- Changeable Amaryllis. (*Amaryllis mutabilis*.) Flowers all the year, in rich mould. Offsets.
- Lovely Amaryllis. (*Amaryllis amabilis*.) Flowers in June and October, in rich mould. Offsets.
- Banded Amaryllis. (*Amaryllis vittata*.) Flowers in July and August, in rich mould. Offsets.
- Pelegrina Alstroemeria. (*Alstroemeria pelegrina*.) Flowers from June to September, in rich mould. Division of the roots.
- St. Martin's Flower. (*Alstroemeria Flos Martini*.) Flowers in June, in rich mould. Division of the roots.
- Ovate Alstroemeria. (*Alstroemeria ovata*.) Flowers in June and July, in rich mould. Division of the roots and by seeds.
- Rather-hairy Alstroemeria. (*Alstroemeria hirtella*.) Flowers in July, in rich mould. Seeds and division of the roots.
- Neill's Alstroemeria. (*Alstroemeria Neillii*.) Flowers in June, in rich light mould. Offsets.
- Acute-leaved Alstroemeria. (*Alstroemeria acutifolia*.) Flowers in July. Seeds and offsets.

## STRIPED.

- Superb Amaryllis. (*Amaryllis superba*.) Flowers in April and June, in rich mould. Offsets.
- Large-flowered Amaryllis. (*Amaryllis grandiflora*.) Flowers in May and June, in rich mould. Offsets.
- Well's Amaryllis. (*Amaryllis Wellsiana*.) Flowers in July and August, in rich mould. Offsets.
- Comely Amaryllis. (*Amaryllis decora*.) Flowers in May and August, in rich mould. Offsets.
- Variegated Amaryllis. (*Amaryllis variegata*.) Flowers in June and July, in rich mould. Offsets.
- Johnson's Amaryllis. (*Amaryllis Johnsoni*.) Flowers in May and June, in rich mould. Offsets.
- Striated-flowered Amaryllis. (*Amaryllis striatiflora*.) Flowers all the year, in rich mould. Offsets.
- Riband-bearing Amaryllis. (*Amaryllis vittifera*.) Flowers in May and July, in rich mould. Offsets.
- Veiny Amaryllis. (*Amaryllis venosa*.) Flowers in June and October, in rich mould. Offsets.
- Four-coloured Amaryllis. (*Amaryllis quadricolor*.) Flowers in June and October, in rich mould. Offsets.
- Many-channelled Amaryllis. (*Amaryllis multistriata*.) Flowers in June and October, in rich mould. Offsets.

## VIOLET.

Capillary Ixia. (*Ixia capillaris*.)  
Flowers in April and May, in sandy  
peat and loam. Offsets.

Bulb-bearing Sparaxis. (*Sparaxis  
bulbifera*.) Flowers in May and  
June, in sandy peat and loam. Off-  
sets.

Catchfly-like Lapeyrousia. (*Lapey-  
rousia silenoides*.) Flowers in May  
and July, in sandy peat and loam.  
Offsets.

Miller's Gladiolus. (*Gladiolus Milleri*.)  
Flowers in April and May, in sandy  
peat and loam. Offsets.

Cloven-leaved Wood-sorrel. (*Ox-  
alis bifida*.) Flowers in September  
and October, in sandy peat. Off-  
sets.

Veiny Wood-sorrel. (*Oxalis venosa*.)  
Flowers in October and November,  
in sandy peat. Offsets.

## GREEN.

Green-flowered Ixia. (*Ixia viridi-  
flora*.) Flowers in May and June, in  
sandy peat and loam. Offsets.

Viper Gladiolus. (*Gladiolus viperatus*.)  
Flowers in April and May, in sandy  
peat and loam. Offsets.

Green-flowered Tritonia. (*Tritonia  
viridis*.) Flowers in July, in sandy  
peat and loam. Offsets.

Calyptrated Amaryllis. (*Amaryllis  
calypttrata*.) Flowers in May and  
August, in rich mould. Offsets.



## THE SUCCULENT HOUSE.

UNTIL within the last few years, succulent plants have had few admirers in this country, since the days of Dillenius, and Lee the founder of the Hammersmith nursery. The names of Haworth, Hitchen, Richardson, and the present venerable curator of the Chelsea gardens, will be immortalized as being the means of retaining in this country a section of plants both curious and splendid, and it gives us pleasure to state that this interesting family is again beginning to attract the attention of the cultivator. It is true, the *Orchideæ* is at present its principal rival, but the trouble and expense of cultivating the latter, when compared with the former, will be always a barrier to their general introduction.

The most valuable collections in England, with which we are acquainted, are those at Claremont, Kew, Woburn Abbey, Walton, Chelsea Botanical Gardens, Mr. Palmer of Shacklewell, and Mackay of Norwich. At Claremont, above nine hundred species are cultivated; and at Woburn, the collection of *Cactus* amounts to about three hundred species.

So little is yet known in this country of the splendour of the flowers of many species of *Cactus*, excepting by description, that we need not particularize any by name, only observing, that few plants we know of can be compared to the *Cactus* (but more properly *Cereus*) *speciosissimus*, *Cereus grandiflora*, *Cactus*, or *Epiphyllum speciosum*, and many hybrids originated in the gardens of this country. The other families of succulents that are conspicuous for fine flowers are *Talinum*, *Mesembryanthemum*, *Crassula*, *Rochea*, *Kalosanthes*, and *Euphorbia*.

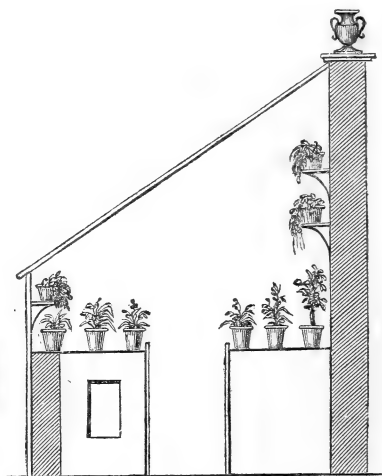
Succulent plants in general are capable of being cultivated in situations where few other exotic plants would live, and require much less labour and attention; they require seldom to be re-potted, and many of them will exist a long time and without water, without sustaining injury. Few of the tenderest of them will suffer in a temperature as low as forty-five or fifty degrees; thus they require little artificial heat, if the house they are kept in is water-tight. Such, therefore, renders them, of all

other plants, the most easily cultivated, and suited to those who superintend the management of their plants themselves. We learn from Mr. Don, that these plants are found in the driest situations, where not a blade of grass nor a particle of moss can grow, on naked rocks, old walls, and sandy hot plains, alternately exposed to the heaviest dews at night, and the fiercest rays of the noon-day's sun. Soil is to them a something to keep them stationary, rather than a means of nourishment, which to those plants is conveyed by myriads of mouths, invisible to the naked eye, but covering all their surface, to the juicy beds of cellular tissue which lie beneath them.

In a humid, high temperature many of them may be grown to a large size in a short time, and all of them, during their growing season, flourish better if the atmosphere around them is kept rather moist than otherwise.

#### STRUCTURES FOR THE CULTIVATION OF SUCCULENTS.

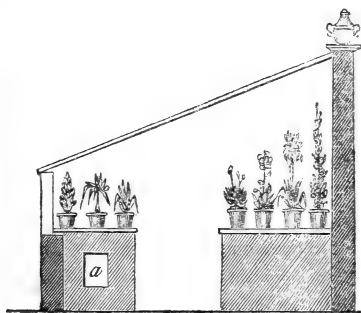
As succulents do not associate either in appearance or culture with any other description of plants, where they are to be extensively cultivated, a



house or houses should be appropriated to them. As few of them attain a great height, at least until they are very old, a low-roofed house is best

for them. The annexed diagram of a section is, in our opinion, the best kind of structure for this purpose.

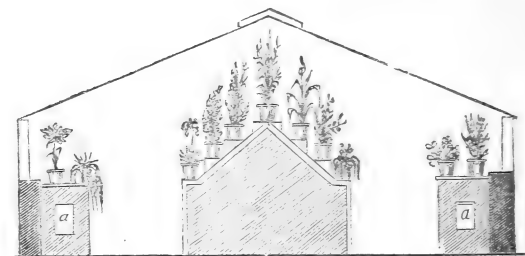
The first represents the Succulent house at Claremont, which is one hundred and ten feet long, by eight feet wide. The passage occupies the middle, and on each side is a platform on which the plants stand; that on the right hand for the taller growing kinds, while those of a more humble growth stand on that on the left. Against the back wall are two shelves for creeping Succulents, and a small shelf under the roof in front is kept for the most delicate and minute. The house is heated by one flue, which enters at one end and terminates at the other. As one end of this house is so much hotter than the other, in consequence of one fire only being used, the plants that require the greatest heat are placed at that end, and those of a hardier character at the other: thus, the *Cactuses*, *Euphorbias*, and *Stapelias*, occupy the hottest end of the house, and are followed by the *Aloe*, *Crassula*, &c., finishing with *Sempervivum* and *Mesembryanthemum*, which require the least heat of any.



The annexed sketch is a Succulent house in the royal gardens at Kew, which is very well adapted for a small collection. The flue (a) extends the whole length of the house under the front platform, and terminates in the back wall at the end farthest from where it entered.

The most complete house for this section of plants would be, in our opinion, a span-roofed structure, as in the annexed diagram, and such a house fifty feet in length would hold a very complete collection. The scandent *Cactæ*, and other slender young kinds, might be trained under the rafters with very good effect. In a house of this description, if

exceeding fifty feet in length, there should be two furnaces, one at each end, and the flues (*a a*) should be placed parallel to the side walls.



#### PROPAGATION AND TREATMENT WHILE YOUNG.

The genus *Mesembryanthemum*, with the exception of a few which are annuals, are all readily cultivated by cuttings, and the annual species by seeds, which ripen freely, and should be sown as soon as they are ripe, in pots of finely-sifted light loam, well drained, and placed on a shelf, or dry, airy place in the Succulent house, till they come up and are fit for potting into single pots. Cuttings may be taken off at any period during spring or summer, dried for a few days in a somewhat shaded place, and then planted in pots well drained and filled with a mixture of light, sandy loam and lime rubbish. They do not require to be covered with bell glasses, but are best placed on a cool, dry shelf, or in any dry pit where they can be shaded for a few days until they begin to make roots. Young wood, of course, should be chosen as emitting roots soonest, and that part of the branch which contains the germinating bud. Most of them will root in from three to five weeks, when they are to be potted into small pots, well drained, and in rich, light loam, with a slight mixture of very rotten dung. The first two sections, viz., *Subacaulia* and *Ringentia*, in Haworth's arrangement of this genus, are so small, and being without branches, can only be increased by dividing the whole plant; but this is a matter of no great difficulty, and only requires caution in the dissection, so as not to occasion larger wounds than absolutely necessary, and also to dry the divided parts previously to planting, as they are liable to rot, or damp off.

The genera *Hoya*, *Stapelia*, *Tridentea*, *Gonostemon*, *Podanthus*, *Orbea*,

*Tromotriche*, *Obesia*, *Duvallia*, *Huernia*, &c., are all perennial plants, and are most readily increased by cuttings, which should be taken off at the junction of the stems, where they are only slightly attached. Some of the very smallest may be divided at the root, and all of them produce seeds which vegetate freely.

CRASSULA COCCINEA, AND C. VERSICOLOR,

Are flowering plants of great beauty and of easy culture. The following remarks on this subject by Mr. G. Harrison, in Vol. VI. of the Floricultural Cabinet, deserve attention.

"In propagating these plants," says Mr. H., "I take off cuttings in March. I find it very essential to dry them a little previous to planting, as, being succulents, they are apt to damp off; each is cut off close under a joint, and about five inches in length. The pots I use are thirty-two's; I place at the bottom of each pot about two inches deep of potsherd, broken small; upon these, one inch deep of mould, then two inches of white sand, in which the cuttings are inserted; six or eight may be planted in one pot; the pot is filled up with mould, which is pressed close round each cutting. The plants are plunged into a hot-bed frame, at from seventy to eighty degrees, which soon causes the cuttings to strike root; I give no water till the cuttings begin to grow, when a little is given with caution. As soon as they have got well rooted, I pot them off into forty-eight sized pots, one in each pot. The compost I use is of equal quantity of rich loam and peat earth, with one sixth part added of lime rubbish, broken fine. I have repeatedly used various other composts, but always found the plants to succeed best in the above. I re-plunge the pots into the frame, and admit at all times as much air and water as the season will admit of. Should any of the cuttings not throw out more than one shoot, the end is pinched off, which will cause the emission of a number of shoots for blooming the following year."

It should here be observed, as it is from the top of the shoots that the flowers are produced, that when flowers are desired, the shoots should be permitted to extend themselves without afterwards being cut. But to return to Mr. H.'s excellent paper.

"The plants are kept in a humid temperature until October, when a little water and heat will be required until March following, when as many plants as are intended to bloom early are plunged into a brisk heat, either in a hot-bed frame, or pine pit, which soon causes the production of a

number of corymbs of bloom; as soon as these appear, the plants are re-potted into thirty-two sized pots, with their bulbs as entire as possible; I give little water, and re-plunge them into the bed; when the blossoms are beginning to expand, the plants are removed into the greenhouse, and by being kept from the hot scorching sun, they keep in bloom for several weeks. By removing a quantity of plants, every three or four weeks, from the cool frame into the hot-bed or pine pit, I have been enabled to have fine blooming plants from May to October following. Those plants which have flowered in March following may be turned out of their pots, and the balls partly reduced, when they may be repotted and managed in every respect as before stated for blooming plants. Plants raised from cuttings when from one to three years old, are by far the best for blooming, and are far preferable to old plants being cut down."

In a very similar manner, we have succeeded in flowering that splendid plant *Rochea falcata*, and some others of similar habits.

The genera *Portulacaria*, *Rochea*, *Kalosanthes*, *Crassula*, *Turgosia*, *Globulea*, *Curtogyne*, are also readily increased by cuttings, and rarely by seeds. We ought, however, to remark, that several very fine hybrids of the genus *Crassula* have been originated in the Bristol nursery by Mr. Maes, and we would beg to direct the attention of cultivators to try similar experiments.

The genus *Hoya* is readily multiplied by the leaves, each of which will, if planted in light soil and kept moderately dry, produce perfect plants. The original genus *Stapelia* (now sub-divided) seeds so freely in a cultivated state, that it is probable that more varieties exist in our gardens than are to be found in an indigenous state, and hence the great confusion which at present exists in regard to their nomenclature. The late Mr. Masson, author of a descriptive work on this genus, and who travelled for several years at the Cape of Good Hope, mentioned to us, many years ago, the great difficulty he had in recognizing the plants of this family which he had sent to the Kew gardens, so much had they become altered by cultivation, for in their native localities they were the smallest of all phœnogamous plants, and existed in the desert sands of Caffraria, far beyond that of any other vegetable, constituting the principal food of a small species of rat, which was, to all appearance, the only animal that could exist upon these limits of perpetual sterility. This genus has also another peculiarity, namely, that of having a very offensive smell while in flower, resembling carrion, and consequently attracting the large flesh-fly, which deposits its eggs in the flower, which in a few days is often filled with maggots.

The genera *Agave* and *Furcraea* are increased only by suckers, which in some species rise abundantly from the roots. Others, however, seldom show a disposition to produce in this manner, unless the centre of the plant be cut out or destroyed; hence some of these are still great rarities in the gardens of this country. Seeds of them are sometimes obtained from South America, of which they are natives; but few of them seed in this country, although one species, *Agave americana*, flowers frequently, and not once in a hundred years, as is vulgarly asserted.

*Litsea geminiflora vera*, the *Buonaparteia juncea* of the gardens, is increased by seeds only, or by destroying the centre of the parent plant, whence a supply of deformed offsets or suckers is obtained.

The genera *Rhipidodendron*, *Pachidendron*, *Aloe*, *Bowiea*, *Gasteria*, *Ha-worthia*, *Apicra*, &c., increase readily by cuttings from such species as produce branches, by suckers which arise from many other species; by seeds, either imported or ripened in this country; and some of the rarer, which neither form branches, flower often, nor send out suckers, are increased by the leaves. These should be taken off when easily separated from the plant, and after being slightly dried, laid, *not planted*, in a pot of mould, kept pretty dry, and moderately shaded; by this means some of the rarer species, such as *Aloe africanum*, *A. ferox*, &c., have been multiplied.

The genus *Echeveria* produces abundance of cauline leaves, that is, small leaves upon the flower stem, which when ripe fall off, and if laid upon the surface of the mould in a pot, will send out roots in a few days, and produce perfect plants in two or three weeks. Through ignorance of this simple mode of increase, the writer of these pages has to accuse himself of being the cause of *Echeveria grandifolia* being lost to this country. It was an imported plant, received by Mr. Tate, of Sloane Square, from Mr. Ackerman, who found it in Mexico; it flowered in his possession, and was figured by the late Mr. Sweet, in his British Flower Garden. This genus is very hardy, and the species *coccinea* and *gibbiflora* are elegant flowering plants.

The families *Cotyledon*, *Anacampseros*, &c., are readily increased in some instances by cuttings, in a similar way to that of *Crassula*, and in others by division of the root:

## EUPHORBIA

Requires bottom heat to cause cuttings of it to root speedily, and the same may be said of the genus *Pedilanthus*.

## SEMPERVIVUM

Is multiplied by cuttings and offsets of the smaller and more common kinds, and the rarer by seeds, which they produce in abundance; but as they die in general after flowering, care must be taken that the seed is saved, and sown immediately after it is ripe.

Several species, believed to be new, are growing vigorously in the Claremont collection of Succulents, which contains nine hundred species, and is supposed to be the richest in Britain. Plants of the larger species of this genus flower beautifully when planted in the flower borders during summer, but, of course, must be taken up and re-potted in the autumn.

The propagation of plants of the natural order *Cactæ* is different in different genera of that order.

## MAMMILLARIA

Is increased by seeds, imported or ripened in this country: some species, such as *coronata*, *cæspitosa*, *stella-aurata*, &c., send out branches or offsets, which when carefully separated from the plant readily strike root if kept dry and moderately warm. Others do not so readily increase, except by seeds. The only method at present known to remedy this, is by cutting out individual *mammillæ*, or teats, and laying them on the surface of mould: keep them dry and covered with a bell glass, till they have begun to make roots, when the glass should be removed, and soon after the plants potted in very small pots, and placed on a dry shelf near the glass in the Succulent house. The spring and summer is of course the most eligible time for this operation. In some tall-growing sorts, such as *eriacantha*, the top may be cut off about the thickness of a shilling, and the wound healed by the application of finely-sifted charcoal, caustic, lime dust, &c., being laid over it occasionally; in some cases the plant will very soon send out shoots from round the top, and at other times years may elapse before this circumstance occurs. These young shoots, when they have attained a proper size, may be carefully cut off and planted, when they will make fine young plants after a time. The same process may again be practised on the old plant, by cutting off another thin slice from its crown, and treating it as above.

## MELOCACTUS.

The genus *Melocactus* is the most difficult to increase of all the *Cactæ*:



we are not aware of any other mode, than that of obtaining them from their native countries, or by diligently endeavouring to obtain seeds of those specimens that flower in the European gardens.

## ECHINOCACTUS.

This section of *Cacteæ*, in many instances, produce offsets in abundance: and many of them flower and produce seeds, from which a supply is obtained. Some few of them admit of having their tops cut off; but when this can be avoided, the better, as it not only disfigures the plant ever after, but there is a considerable hazard run of losing it altogether.

## CEREUS.

This extensive and fine-flowering genus are all most readily increased by cuttings, excepting those which have but one stem, such as *C. senilis*, *grandis*, and others, to obtain which it is necessary to take the tops off as above mentioned. The others, which send up several stems, or divide themselves into branches, are readily propagated by the ordinary means.

*Cereus speciosissimus* is certainly one of the most splendid of all plants, and is both easily cultivated and flowered. It is propagated by cuttings, which should be left in a dry, cool place for a few days after being taken from the parent plant, before they are planted, for if this precaution is not taken, there will be great danger of their rotting, instead of sending out roots. Light, sandy soil, or light loam, with a considerable portion of lime rubbish, broken fine, mixed with it, is the most proper soil in which to root all the Cactus tribe. They will require scarcely any water until they begin to grow, after which they will require it in considerable quantity. These plants, by good cultivation, may be speedily grown to a very large size; but like all other plants required of a large size, they must have abundance of food and plenty of pot room. A plant of this sort was grown by one of the most successful cultivators in Scotland, the late Mr. Henderson, of Woodhall, in a few years' time, to a sufficient size to cover a trellis of eighty-four square feet, and produced the amazing number of three hundred flowers, all expanded at the same time. This plant grew in a pot, in a soil composed of two parts rich loam, three of

decomposed manure, and one consisting of equal quantities of peat, sand, and broken tiles. Abundance of water is required for this species while it is in a growing state, and while it is maturing its flower buds; but during winter, or when the plant is in a state of rest, little or no water should be given to it.

#### EPIPHYLLUM.

This genus is readily propagated by cuttings, and some of them seed freely, particularly the hybrid varieties, of which there are many; and all of them free and splendid flowerers. This genus is also successfully grown by being grafted on the more common *Opuntiaceæ*, and best of all on the common *Pereskia*.

The process of grafting is exceedingly simple: a small part of the plant intended to be grafted is selected, a thin slice of the fleshy part of both stock and graft is taken off, and the sap is so glutinous that the piece will adhere without the usual modes of securing; but, for greater certainty, it is advisable to fasten it with bass. During the operation, great care must be taken not to bruise the parts operated upon, as, if such be the case, there would be some danger of the plants rotting. *Epiphyllum truncatum*, &c. may be grafted on *Cereus triqueter*, or *Pereskia aculeata*, with good effect, as that beautiful plant is seen to most advantage when elevated so that the flowers are placed above the level of the eye of the observer; besides, the pendent direction of the plant will cause it to produce its blossoms much more abundantly.

#### OPUNTIA.

All of this genus are readily increased by cuttings taken off at a joint, and partially dried before planting. The branches of this tribe will live six months out of the ground, if kept in a cool, dry place (above the freezing point), and, according to Haworth, have been found serviceable at sea in long voyages, when other vegetables could not be procured. They abound in a highly anti-scorbutic juice and pulp, and, therefore, might be worth the future attention of navigators, as they are to be obtained in great abundance in hot climates.

The two genera *Rhipsalis* and *Pereskia* strike freely by cuttings; and the former produces seeds abundantly, which vegetate very freely in a light soil and genial warmth.

Mr. D. Pearce, in the Horticultural Cabinet, Vol. II. p. 175, gives the following as his practice in the cultivation of the genus *Cactus* :—

“All the species of *Cactus*,” that is, the fine-flowering sorts, “may be treated as follows:—Put them in loam and peat, or sandy loam, mixed with about a fourth part of lime rubbish. Always let the pots in which they are planted be as small as the plants will allow: large pots are injurious, because the roots are prevented from reaching the sides for so long a time, and the body of soil is liable to retain too much moisture every time the plant is watered. Always give a good drainage, by laying in each pot a good portion of broken potsherds, as the least stagnation is always injurious, sometimes fatal; therefore, never allow them to stand in the pans or feeders in which the pots are sometimes placed. Water very seldom, not more than twice a week when they are flowering, and not so often at other times; give very little at a time, not more than will moisten the soil all over, particularly if the weather is not fine and sunny. About the middle of June, turn them out of doors into a situation where they will not be exposed to winds, but perfectly open to the rays of the mid-day sun. Place them on a board or floor of any kind, to prevent the worms from entering through the bottoms of the pots. This system of exposing them in summer gives them a check which seldom fails to produce a good bloom. Whilst out of doors, they must not be allowed to receive the heavy dashing rains, or they will suffer, perhaps die, in consequence; either a boarded roof, or other shelter, must be provided for them on such occasions. Also, if the pots stand on a floor of slates or flags, they should be partly plunged in moss; as the sun, by heating the pots, sometimes burns the roots of the plants. In September, take the plants into the greenhouse, and place them in a situation where they will receive plenty of light and air during winter. Early in the spring, remove them to the stove in succession as they are required to bloom. Most of the species will flower very fine, without being placed out of doors at all; but by placing them out as above, the flowers will be much finer, and more abundant, than when grown regularly in the house: they may be increased by cuttings, seeds, and grafting.”

#### GENERAL TREATMENT WHEN IN THE HOUSE.

Succulent plants, so far from requiring the temperature of a stove, as erroneously supposed by many, are most certainly much more injured by too high a temperature than by being kept too cool. If we except the

genera *Stapelia* and *Euphorbia*, and a few of the *Cactææ*, all others are much better when kept in a cool, dry, airy greenhouse, than anywhere else : nay, a cold pit, if not in a damp situation, will be a very proper habitation for many of them ; and not a few, particularly of the families *Sempervivum* and *Mesembryanthemum*, stand in the open borders of our gardens during the most rigorous frosts with which we have of late years been visited, with the exception of the winter of 1837-8.

Another very erroneous notion, which till of late has very generally prevailed, is, that succulents should be planted in lime rubbish, gravel, or similar porous matter, with a view to prevent them from growing too rapidly, and also, that they should scarcely have any water given to them. The truth of the matter is, that this singular and interesting tribe of plants have been long neglected in this country, and placed in situations in the greenhouse where little attention has been paid to them ; and many of them, notwithstanding this treatment, have continued to live thus disregarded and unnoticed, till their splendour, or the fragrance of their bloom, arrested, for a time, the attention of the owner : then they may have been brought into a more favourable situation till their flowers had faded, when, for the most part, they were consigned again to their old situation. Plants requiring so little attention as this to keep them in existence, and the only fear of losing them being from an excess of damp, led the indolent gardener to plant them where they were not likely to suffer from this cause, and at the same time rid himself of the trouble of attending to them. Plants may exist for a long time under very bad treatment ; but plants so circumstanced cannot be expected to flower well, or to attain any very extraordinary habit, either of beauty or singularity. But the same species of plants, treated in a more rational and favourable manner, will develop all their beauties and singularities to us in return.

Succulent plants, in general, do not require much water during winter, when they are in a dormant state ; but during spring and summer, when they are growing vigorously, they require as large a share of that element as any other plants (not exactly aquatic). During winter, care must be taken that they are not over-watered, and also that the house they are grown in is water-tight, for many of the more delicate would suffer if rain drops were to fall into their centre, and more particularly those that are kept in a low temperature. A good way to supply many plants of this description with water is, by standing the pots in pans of water ; but this is only to be understood as applicable to the most robust-growing sorts during spring and summer ; and to the more delicate ones occasionally. During spring and summer, they may be syringed over their tops once

or twice a-week; but during autumn and winter, this should be discontinued.

Air cannot be too freely admitted to them at all seasons, both in winter and summer; and during the latter period, the side lights of the Succulent house, at least that portion of it dedicated to the families *Sempervivum*, *Crassula*, *Mesembryanthemum*, &c., should be altogether removed: that portion in which *Stapelia*, *Cactææ*, &c., are kept, should only be thus openly exposed in very warm days, but a partial degree of ventilation must be given them upon all fitting occasions.

A watchful eye must be kept that the smaller and more delicate do not suffer from damp, and that cuttings of those apparently likely to die or become unsightly be put in, for many of the more curious are not long-lived. Frequent cleaning the surface of the mould in the pots; examining them minutely for the detection of insects, which they are liable to, particularly the scale, white bug, and green fly; rubbing off the former with a sponge and soft soap, washing the second off with clear water applied by the engine, and using tobacco smoke, or Scotch snuff sprinkled over them, when damp from previous watering, will completely rid them of these enemies.

There are two curious and often fatal diseases to which some succulent plants are subject, particularly the genus *Opuntia*, and some other of the *Cactææ*; and these are admirably described by M. Thiery de Menonville, who travelled, many years since, through the Spanish settlements of South America. These diseases are termed by him the gangrene and *la dissolution*. The former of these is of frequent occurrence, beginning with a black spot, which spreads till the whole plant ultimately dies. The latter disease is very appropriately called *la dissolution*, and is much more serious in its effects than the former: it is described by the late eminent Sir James Edward Smith, in "Introduction to Physiological and Systematic Botany," as follows:—"This seems to be a sudden decay of the vital principle, like that produced in animals by lightning or strong electricity. In an hour's time, from some unknown cause, a joint, a whole branch, or sometimes an entire plant of the nopal (the Indian name for the *Opuntia cochinillifera* or Indian fig), changes from a state of apparent health to a state of putrefaction or dissolution. One minute its surface is verdant and shining; the next it turns yellow, and all its brilliancy is gone. On cutting into this substance, the inside is found to have lost all cohesion, being quite rotten. The only remedy in this case is speedy amputation below the diseased part." Both these diseases are not unfrequently observed in collections in this country, and if the former be not arrested in

its progress by amputating the branch upon which it appears before the disease has extended too far, the consequence would be the loss of the plant in a day or two.

Some of the continental cultivators of these plants have grown them to a large size within a very short space of time, excluding the air by placing a tall bell-glass over the plant, supplying it with abundance of water and heat in the stove, and also by placing them in a very warm hot-bed; thus stimulated to the utmost extent, the plant swells out to a large size; but care must be taken that this humidity be not carried too far, for fear of rotting the plant.

In regard to temperature, most succulent plants will stand uninjured when the thermometer falls to forty-five degrees, or even lower, but many of them will also stand several degrees of frost with impunity. Excepting the *Cactææ*, *Stapelia*, and *Euphorbia*, all other succulents are rather injured by artificial heat than benefited. They will stand any degree of sun heat, but fire heat is a very different thing.

The late Mr. Haworth, in his "*Supplementum Plantarum Succulentarum*," speaking of the culture of succulent plants, transcribes the following passage from Miller, a passage which, he says, "is worthy of being recorded in letters of gold; and more especially," he adds, (and we may add so also) "as the truth it inculcates, or rather complains of, still continues to exist." The quotation alluded to is to the following effect: "At which time (October) you should remove them (the succulents) into the conservatory, placing them as near the windows as possible at first, letting them have as much free open air as the season will permit, by *keeping the windows open* whenever the weather is good. And now you must begin to abate your waterings, giving it to them sparingly; but you *should not suffer the leaves to shrink for want of moisture*, which is another *extreme* some people run into for want of a little observation; for when they are *suffered to shrink* (not die gradually away) for want of *sufficient moisture to keep their vessels distended*, they are *rendered incapable of discharging this moisture whenever they receive it again*."

"I humbly hope," adds Mr. Haworth, "this golden passage from our great horticulturist will have more effect over those who read it, than all my own more feeble pen has heretofore stated to the same effect. For, at this enlightened period, it requires but a moderate share of philosophy to allow that air and exercise, and a due supply of warmth and food, are all essential requisites towards the healthful support of every organised being, whether of the animal or vegetable kingdom. And air and the

rustling winds are the exercise of plants ; and humidity and water are at least the vehicles which convey their food ; and warmth the medium which adapts them to receive it in a salutary way ; although the degree of warmth actually requisite is as different for the different species as the different climates over which the Creator has been pleased to distribute them,—by no means at random, but all in harmoniously beautiful order. And those which it has pleased their great Architect to place in equinoctial latitudes appear to be more adapted to the reception of nutriment above ground, by absorption from the air, in the dewy places of their nativity, than those whose absorbing orifices are less capaciously expanded in more temperate countries ; or in those still more chilly regions which approach the confines of perpetual snow. There the great business of nutrition appears to be almost wholly from the root. And hence, perhaps, the impatience which Alpine plants evince to heat, which actually exhausts and overpowers them.

‘O Jehovah ! in sapientiâ ea fecisti.’”

#### GENERAL TREATMENT WHEN OUT OF DOORS.

All the strong-growing shrubby *Mesembryanthema*, *Crassulæ*, *Aloes*, *Semperviva*, &c., are benefited by being placed out of the house from the beginning of June till the middle of September. They should be placed on a floor of boards, pavement, or hard-rolled gravel, and in a situation as much exposed to the full sun as possible ; and if it can be so arranged conveniently, an awning should be placed over them in times of continued rain : they would derive benefit from such protection.

The more common of the genus *Mesembryanthemum* may be planted out in June, upon a warm, dry border, where they will flower beautifully all the summer, and some of them will stand the winter. Cuttings of such sorts should, however, be taken off in spring, from which a supply of young plants will be obtained to take their place in the Succulent house in September, when the collection is taken into the house.

The hybrid and other free-flowering *Cactææ*, when done flowering, should be taken out, and for a few days placed in an open shed or pit, where they can be partially shaded from the full sun ; afterwards they should be placed in an exposed situation, similar to that chosen for the rest of the collection. Here they will remain during summer, by the end of which

their flower buds will be formed within the branches, which would not be the case were they left in the house.

#### SOIL.

We have already observed that a light, rich, loamy soil is the best for most plants of this description. The free-flowering *Cactææ* should be placed in the richest possible soil, but at the same time it must be capable of admitting the water to pass through it freely, and for that reason may have a portion of lime rubbish, broken pots, or small pieces of broken bricks mixed with it, to keep it open and porous. Poor, sandy soil should be discarded; and even peat earth, although recommended by some cultivators, is not rich enough for these plants.

#### SHIFTING OR POTTING.

There are few species of succulents, until they have attained a pretty large size, but what will be the better for being examined at least once a-year. The most proper season for this operation is in spring, prior to their beginning to grow. Many may not require re-potting, particularly into larger pots, but all will be the better for being examined, were it only to see the state of their roots, and to regulate the draining should it be found to be faulty. The majority of these plants require pots less in size than that of other plants in general. They require to be thoroughly drained, as stagnant water at the root is very injurious to them. Most of the first seven sections of *Mesembryanthemum*, according to Haworth's arrangement, that is, from the species *minutum* to *denticulatum*, as they stand in Loudon's "Hortus Britannicus," should be planted high in the pot, that is, elevated in the centre of the pot an inch or an inch and a half above the level of the top of the pot, as they are very impatient of much moisture. These, for a similar reason, should never be removed out of the house, especially as the sparrows are apt to eat them if so exposed.

When it is desired to obtain large specimens of succulent plants, they must, like all other plants, be frequently shifted into larger pots, and supplied with plenty of water in a rich soil. We have known *Cereus speciosissimus* to make shoots six feet long in the course of



two seasons, by being planted out in a rich border. Of course such rapidity of growth is unfavourable to their flowering freely. Many do not shift or pot their succulents above once in two, three, or four years; many kinds do not require it oftener, but they are the small and slow-growing kinds, such as most of the melon-shaped *Cactææ*, &c. After most succulents have attained their full size, shifting may be dispensed with oftener than while growing, for most of them flower best when they have ceased to grow rapidly.

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While revising the preceding pages for the press, we are in receipt of the following interesting information on the habits and cultivation of the *Cactææ* from our respected friend Mr. Beaton, who, with his employer, Mr. Harris, of Kingsbury, has paid more than ordinary attention to the subject. Mr. Harris is an enthusiastic patron of botanical pursuits, and has been some time engaged in forming a collection, not of living species only, but also of dead specimens for his herbarium.

“In writing on the *Cacti*,” says our correspondent, “I hope you will record your dissent from those who consider the sections into which the old genus *Cactus* has been divided as distinct genera. Nothing can be more incorrect, and nothing tends more to mystify the writings of our best gardeners than thus following the *dicta* of the great men who have the lead in Botanical science; a zoologist might as well attempt to divide the greyhound, bull-dog, or terrier, into distinct genera, as botanists to divide the *Mammillaria* and others from the *Cactus*. Yet, into this error Mr. Don has fallen (*System of Botany*, Vol. III. p. 157), when he describes the *Mammillaria* as destitute of a woody axis or central column. All the sections of the genus have not only a woody axis, but a medulliferous column inside their woody axis, like other exogenous plants.

“This axis, however, is not formed during the first few years of their existence, and probably different species require different periods to form it; while in its turn it is not at first supplied with its medulla or pith: both the woody axis and pith make their first appearance at the collar of the plant at the point where the roots start from the stem. As the axis increases it throws out fibres into all parts of the succulent portion of the plant, and is the channel through which the nourishment is supplied from the roots; and I am of opinion that the *Melocactus*, *Echinocactus*, and *Mammillaria* will not form roots from cuttings until they first

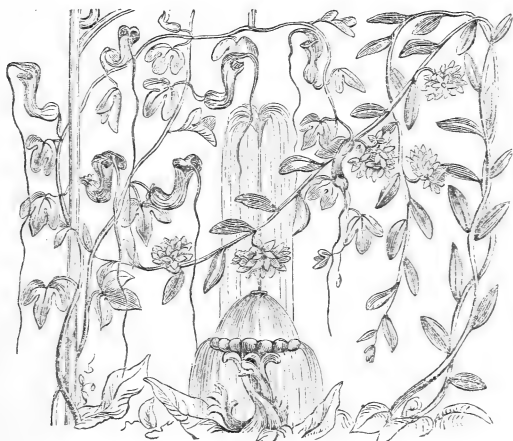
form their woody axis: all the roots of these sections proceeding from the axis, while the *Opuntia* and *Epiphyllum*, whose young shoots are analogous to leaves, throw out roots from all parts of their surface."

The following remarks from the same pen may be useful both to collector and cultivator of this interesting family. "In gathering the *Cacti* in their native wilds, the collector is often satisfied with pulling them up by main force, without being aware how slightly they are attached to their central column: if the plant is firmly rooted, the fibres which connect the column with the succulent part of the plant are broken in the act of pulling them up, and the central column itself is often twisted or broken asunder. The effect of such violence is often the death of the plant, although it may appear in every respect to be alive and in a healthy state.

"Hitherto collectors have been satisfied with transmitting seeds or cuttings of cactaceous plants home; but now that a taste for the cultivation of this grotesque and interesting family is obtaining in this country, good specimens will be sought after, and the extreme danger of pulling them up by force cannot be too seriously impressed on the attention of collectors: in all cases, unless the plant be very small, the roots should be cut with a sharp instrument, and as far from the stem as circumstances will allow, but in no instance should they be twisted about. During last summer a fine collection was brought over from Mexico by a Frenchman, who lost some splendid specimens through his ignorance of this connection of the central column with the plant. Mr. Harris bought some of the best of the dead specimens for his cabinet, and very luckily I got seeds out of all of them, and thus preserved them to the country: the seedlings under my care exceed ten thousand in number from this importation alone. In young seedlings, sow them in pure sand, keep them constantly moist, and transplant them as soon as you can get hold of them, in sand well drained: give as much heat and moisture as your means will allow, and keep up this stimulus till they have begun to form their woody centre, when they must be more sparingly watered. As a means of extending the cultivation of succulents in general, the hybridist should exercise his art. The *Mesembryanthema* might be crossed till they could vie with the *Cinerariae*, and the *Aloes* till they surpass the *Gesneriæ*."

We cannot sufficiently commend Mr. Harris for his great liberality in possessing himself of these splendid accessions to the *Cacti* already known, or Mr. Beaton for his zeal and intelligence, displayed in obtaining the seeds from many of the dead species of the melon-shaped kinds. The

seeds of these are mostly imbedded in a soft downy matter, which is thrown up from their top, even long after they are dead, and may also be discovered by cutting the plants transversely across; but so far as we know, this is a discovery to the credit of which Mr. Harris and his gardener are alone entitled. Mr. Harris has in his herbarium one species, *Cereus senilis*, measuring three feet in circumference, and by far the finest specimen ever brought to Europe, from which Mr. Beaton originated above one hundred seedlings by the above means.



## SELECT LIST OF SUCCULENTS.

## YELLOW.

- Tree Houseleek. (*Sempervivum arboreum*.) Flowers in March and December, in sandy loam. Cuttings.
- Canary Houseleek. (*Sempervivum canariense*.) Flowers in June and July, in sandy loam. Seeds.
- Glandulous-leaved Houseleek. (*Sempervivum glandulosum*.) Flowers in March and May, in sandy loam. Cuttings.
- Turfy Houseleek. (*Sempervivum caespitosum*.) Flowers in April and September, in sandy loam. Cuttings.
- Bearded Houseleek. (*Sempervivum barbatum*.) Flowers in July and August, in sandy loam. Cuttings.
- Smith's Houseleek. (*Sempervivum Smithii*.) Flowers in July and August, in sandy loam. Cuttings.
- Golden Houseleek. (*Sempervivum aureum*.) Flowers in July and August, in sandy loam. Offsets and seeds.
- Table-shaped Houseleek. (*Sempervivum tabulaforme*.) Flowers in July and August, in sandy loam. Offsets, produced by destroying the centre of the plant, by which means numerous offsets are produced; it also seeds freely.
- Twisted Houseleek. (*Sempervivum tortuosum*.) Flowers in July and August, in sandy loam. Cuttings.
- Villous Houseleek. (*Sempervivum villosum*.) Flowers in June and July, in sandy loam. Cuttings.
- Small-studded Crassula. (*Crassula bulbulata*.) Flowers in August and September, in sandy loam. Cuttings.
- Ciliated Crassula. (*Crassula ciliata*.) Flowers in July and August, in sandy loam. Cuttings.
- Prince's Pachidendron. (*Pachidendron principis*.) Flowers in March and November, in sandy loam. Suckers.
- Hedgehog Pachidendron. (*Pachidendron ferox*.) Flowers in April and May, in sandy loam. Offsets, obtained by cutting off the head.
- Chinese Aloe. (*Aloe chinensis*.) Flowers in July and August, in sandy loam. Suckers.
- Green Aloe. (*Aloe virens*.) Flowers in August and September, in sandy loam. Suckers.
- Tiger-chap Fig-Marigold. (*Mesembryanthemum tigrinum*.) Flowers in September and November, in sandy loam. Cuttings.
- Fragrant Fig-Marigold. (*M. fragrans*.) Flowers in August and October, in sandy loam. Cuttings.
- Great-flowered Fig-Marigold. (*M. grandiflorum*.) Flowers in July, in sandy loam. Cuttings.
- Tongue-shaped Fig-marigold. (*M. linguaeforme*.) Flowers in March and November, in sandy loam. Cuttings.
- Salm's Fig-Marigold. (*M. Salmii*.) Flowers in September and November, in sandy loam. Cuttings.
- Various-leaved Fig-Marigold. (*M. heterophyllum*.) Flowers in October and November, in sandy loam. Cuttings.
- Two-bunched Fig-Marigold. (*M. bigibberatum*.) Flowers in August, in sandy loam. Cuttings.
- Two-toothed Fig-Marigold. (*M. bidentatum*.) Flowers in August, in sandy loam. Cuttings.
- Dagger-formed Fig-Marigold. (*M. pugioniforme*.) Flowers in July and September, in sandy loam. Cuttings.
- Headed Fig-Marigold. (*M. capitatum*.) Flowers in July and September, in sandy loam. Cuttings and seeds.

Short-stemmed Fig-Marigold. (*M. brevicaule*.) Flowers in July and September, in sandy loam. Cuttings and seeds.

Golden-flowered Fig-Marigold. (*M. aureum*.) Flowers in March and October, in sandy loam. Cuttings.

Orange-flowered Fig-Marigold. (*M. aurantium*.) Flowers in July and August, in sandy loam. Cuttings.

Variable Fig-Marigold. (*M. variabile*.) Flowers in June and August, in sandy loam. Cuttings.

Expanded-leaved Fig-Marigold. (*M. expansum*.) Flowers in July and August, in sandy loam. Cuttings.

Bright Fig-Marigold. (*M. nitidum*.) Flowers in July and October, in sandy loam. Cuttings.

Brachiata Fig-Marigold. (*M. brachia-*

*tum*.) Flowers in June and August, in sandy loam. Cuttings.

Salmon-coloured Fig-Marigold. (*M. salmoneum*.) Flowers in August and October, in sandy loam. Cuttings.

Pale-flowered Fig-Marigold. (*M. pallens*.) Flowers in July and August, in sandy loam. Cuttings.

Sunflower-like Fig-Marigold. (*M. helianthoides*.) Flowers in August and October, in sandy loam. Seeds.

Bracted Fig-Marigold. (*M. bracteata*.) Flowers in July and October, in sandy loam. Cuttings.

Small-yellow Fig-Marigold. (*M. flavum*.) Flowers in August, in sandy loam. Cuttings.

Hedgehog Fig-Marigold. (*M. echinatum*.) Flowers in July and October, in sandy loam. Cuttings.

## RED.

Sickle-leaved Rochea. (*Rochea falcata*.) Flowers in June and September, in sandy loam. Cuttings.

Mediate Kalosanthes. (*Kalosanthos media*.) Flowers in June and July, in sandy loam. Cuttings.

Changeable Kalosanthes. (*Kalosanthos versicolor*.) Flowers in March and September, in sandy loam. Cuttings.

Cymose Kalosanthes. (*Kalosanthos cymosa*.) Flowers in August, in sandy loam. Cuttings.

Oblique-leaved Crassula. (*Crassula obliqua*.) Flowers in April and May, in sandy loam. Cuttings.

Pretty Crassula. (*Crassula pulchella*.) Flowers in May, in sandy loam. Cuttings.

Plaited Rhipidodendron. (*Rhipidodendron plicatile*.) Flowers in June and July, in sandy loam. Cuttings.

African Pachidendron. (*Pachidendron africanum*.) Flowers in July, in sandy loam. Cuttings or offsets, obtained by cutting off the head; also by the leaf laid on the surface of the mould till it roots.

Narrow-leaved Pachidendron. (*Pachidendron angustifolium*.) Flowers in July and August, in sandy loam. Suckers.

Dichotomous Aloe. (*Aloe dichotoma*.) Flowers in June and August, in sandy loam. Cuttings.

Spike-flowered Aloe. (*Aloe spicata*.) Flowers in July and August, in sandy loam. Suckers.

Yellow-spined Aloe. (*Aloe flavispina*.) Flowers in August, in sandy loam. Suckers.

Distant Aloe. (*Aloe distans*.) Flowers in August, in sandy loam. Suckers.

Glaucous Aloe. (*Aloe glauca*.) Flowers in January and September, in sandy loam. Suckers.

Fringe-leaved Aloe. (*Aloe ciliaris*.) Flowers in June and July, in sandy loam. Suckers.

Succotrine Aloe. (*Aloe succotrina*.) Flowers in February and April, in sandy loam. Cuttings.

Mitre-formed Aloe. (*Aloe mitraeformis*.) Flowers in August, in sandy loam. Suckers.

Banded Gasteria. (*Gasteria fasciata*.) Flowers in June and July, in sandy loam. Suckers.

Dark Gasteria. (*Gasteria nigricans*.) Flowers in June and July, in sandy loam. Suckers.

Thick-leaved Gasteria. (*Gasteria crassifolia*.) Flowers in June and July, in sandy loam. Suckers.

Blunt-leaved Gasteria. (*Gasteria obtusifolia*.) Flowers in June and July, in sandy loam. Suckers.

Angled Gasteria. (*Gasteria angulata*.) Flowers in March and November, in sandy loam. Suckers.

Narrow-leaved Gasteria. (*Gasteria angustifolia*.) Flowers in March and September, in sandy loam. Suckers.

Smooth Gasteria. (*Gasteria levis*.) Flowers in March and September, in sandy loam. Suckers.

Subverrucose Gasteria. (*Gasteria subverrucosa*.) Flowers in March and September, in sandy loam. Suckers.

Shining Gasteria. (*Gasteria nitida*.) Flowers in July and August, in sandy loam. Suckers.

- Triangular Gasteria. (*Gasteria tri-gona*.) Flowers in June and August, in sandy loam. Suckers.
- Cylindrical Fig-Marigold. (*Mesembryanthemum cylindricum*.) Flowers in February and September, in sandy loam. Cuttings.
- Round-leaved Fig-Marigold. (*M. tere-tifolium*.) Flowers in February and September, in sandy loam. Cuttings.
- Daisy-flowered Fig-Marigold. (*M. bel-lidiflorum*.) Flowers in June and August, in sandy loam. Cuttings.
- Great-acute-leaved Fig-Marigold. (*M. acutum*.) Flowers in April and November, in sandy loam. Cuttings.
- Dotted-awl-leaved Fig-Marigold. (*M. punctatum*.) Flowers in April and November, in sandy loam. Cuttings.
- Slender - starry Fig - Marigold. (*M.*
- gracile*.) Flowers in August and November, in sandy loam. Cuttings.
- Rayed Fig-Marigold. (*M. radiatum*.) Flowers in August and November, in sandy loam. Cuttings.
- Compressed Fig-Marigold. (*M. com-pressum*.) Flowers in July and September, in sandy loam. Cuttings.
- Short-leaved Fig-Marigold. (*M. brevi-folium*.) Flowers in July and October, in sandy loam. Cuttings.
- Subglobose Fig-Marigold. (*M. sub-globosum*.) Flowers in July and October, in sandy loam. Cuttings.
- Diminished Fig-Marigold. (*M. diminu-tum*.) Flowers in April, in sandy loam. Cuttings.
- Showy Epiphyllum. (*Epiphyllum spe-ciosum*.) Flowers in June and July, in sandy loam. Cuttings.

## WHITE.

- Jasmine - like Kalosanthes. (*Kalo-santhes jasminea*.) Flowers in April and May, in sandy loam. Cuttings.
- Four - angled Crassula. (*Crassula tetragona*.) Flowers in August, in sandy loam. Cuttings.
- Biplanate Crassula. (*Crassula bi-planata*.) Flowers in September, in sandy loam. Cuttings.
- Round - leaved Crassula. (*Crassula rotundifolia*.) Flowers in August and September, in sandy loam. Cuttings.
- Revolving Crassula. (*Crassula re-volvens*.) Flowers in August and September, in sandy loam. Cuttings.
- White-flowered Crassula. (*Crassula albiflora*.) Flowers in June and July, in sandy loam. Cuttings.
- Double convex Crassula. (*Crassula biconvexa*.) Flowers in August, in sandy loam. Cuttings.
- Imbricated Crassula. (*Crassula im-bricata*.) Flowers in June and July, in sandy loam. Cuttings.
- Small-rosy Crassula. (*Crassula rosu-laris*.) Flowers in July, in sandy loam. Cuttings.
- Magnol's Crassula. (*Crassula Mag-noli*.) Flowers in June and July. Cuttings.
- Bracelet-shaped Fig-Marigold. (*Mesembryanthemum moniliforme*.) Flowers in March and April, in sandy loam. Cuttings.
- Twin-shooted Fig-Marigold. (*M. gem-inatum*.) Flowers in June and August, in sandy loam. Cuttings.
- Pretty-white-flowered Fig-Marigold. (*M. lepidum*.) Flowers in August
- and September, in sandy loam. Cuttings.
- Clandestine Fig-Marigold. (*M. clan-destinum*.) Flowers in May and August, in sandy loam. Cuttings.
- Lorate Fig-Marigold. (*M. loratum*.) Flowers in July and August, in sandy loam. Cuttings.
- Skeleton - leaved Fig - Marigold. (*M. anatomicum*.) Flowers in July and August, in sandy loam. Cuttings.
- Shining Fig-Marigold. (*M. splendens*.) Flowers in June and August, in sandy loam. Cuttings.
- Flexuose Fig-Marigold. (*M. flexuosum*.) Flowers in July and August, in sandy loam. Cuttings.
- Umbellate-flowered Fig-Marigold. (*M. umbelliflorum*.) Flowers in August and September, in sandy loam. Cuttings.
- Night - flowering Fig - Marigold. (*M. noctiflorum*.) Flowers in June and August, in sandy loam. Cuttings.
- Long-cupped Fig-Marigold. (*M. caly-cinum*.) Flowers in July and August, in sandy loam. Cuttings.
- Ciliated Fig-Marigold. (*M. ciliatum*.) Flowers in July and September, in sandy loam. Cuttings.
- Joint - flowering Fig - Marigold. (*M. geniculiflorum*.) Flowers in July and September, in sandy loam. Cuttings.
- Trailing Fig-Marigold. (*M. humifu-sum*.) Flowers in July and August, in sandy loam. Cuttings.
- Small - flowered Fig - Marigold. (*M. parviflorum*.) Flowers in August, in sandy loam. Cuttings.

Great-flowering Cereus. (*Cereus grandiflorus*.) Flowers in June and August, in sandy loam. Cuttings.

Arched Cereus. (*Cereus arcuatus*.) Flowers in May and June, in sandy loam. Cuttings.

Triangular Cereus. (*Cereus triangularis*.) Flowers in July and August, in sandy loam. Cuttings.

Hooker's Epiphyllum. (*Epiphyllum Hookeri*.) Flowers in July and August, in sandy loam. Cuttings.

## PINK.

Branchy Crassula. (*Crassula ramosa*.) Flowers in July and August, in sandy loam. Cuttings.

Arborescent Crassula. (*Crassula arborescens*.) Flowers in May and June, in sandy loam. Cuttings.

Heart-leaved Crassula. (*Crassula cordata*.) Flowers in May and August, in sandy loam. Cuttings.

Small-spined Aloe. (*Aloe micracantha*.) Flowers in July, in sandy loam. Cuttings.

Variegated Aloe. (*Aloe variegata*.) Flowers in March and September, in sandy loam. Cuttings.

Twin Fig-Marigold. (*Mesembryanthemum geminatum*.) Flowers in May, in sandy loam. Cuttings.

Twiggy Fig-Marigold. (*M. sarmentosum*.) Flowers in April, in sandy loam. Cuttings.

Robust Fig-Marigold. (*M. validum*.) Flowers in May and June, in sandy loam. Cuttings.

Scholl's Fig-Marigold. (*M. Schollii*.) Flowers in May and June, in sandy loam. Cuttings.

Red-stalked Fig-Marigold. (*M. rubricaulis*.) Flowers in February and December, in sandy loam. Cuttings.

Polished Fig-Marigold. (*M. levigatum*.) Flowers in June, in sandy loam. Cuttings.

Red-bordered Fig-Marigold. (*M. rubrocinctum*.) Flowers in June, in sandy loam. Cuttings.

Ross's Fig-Marigold. (*M. Rossii*.) Flowers in June, in sandy loam. Cuttings.

Creeping Fig-Marigold. (*M. reptans*.) Flowers in July and August, in sandy loam. Cuttings.

Thick-leaved Fig-Marigold. (*M. crassifolium*.) Flowers in May and August, in sandy loam. Cuttings.

Scissor-leaved Fig-Marigold. (*M. forficatum*.) Flowers in September and October, in sandy loam. Cuttings.

Leafy Fig-Marigold. (*M. foliosum*.) Flowers in September, in sandy loam. Cuttings.

Saw-keeled Fig-Marigold. (*M. serratum*.) Flowers in July and August, in sandy loam. Cuttings.

Purple-sworded Fig-Marigold. (*M.*

*gladiatum*.) Flowers in June, in sandy loam. Cuttings.

Various-petaled Fig-Marigold. (*M. heteropetalum*.) Flowers in May and August, in sandy loam. Cuttings.

Glaucous Fig-Marigold. (*M. glaucinum*.) Flowers in July and August, in sandy loam. Cuttings.

Changeable Fig-Marigold. (*M. mutabile*.) Flowers in July and September, in sandy loam. Cuttings.

Pretty Fig-Marigold. (*M. pulchellum*.) Flowers in May, in sandy loam. Cuttings.

Lunate Fig-Marigold. (*M. lunatum*.) Flowers in July, in sandy loam. Cuttings.

Clustered Fig-Marigold. (*M. glomeratum*.) Flowers in June and August, in sandy loam. Cuttings.

Changeable-coloured Fig-Marigold. (*M. versicolor*.) Flowers in May and October, in sandy loam. Cuttings.

Retroflexed Fig-Marigold. (*M. retroflexum*.) Flowers in May and October, in sandy loam. Cuttings.

Imbricating Fig-Marigold. (*M. imbricans*.) Flowers in May and October, in sandy loam. Cuttings.

Many-flowered Fig-Marigold. (*M. polyanthos*.) Flowers in August, in sandy loam. Cuttings.

Two-edged Fig-Marigold. (*M. anceps*.) Flowers in September and October, in sandy loam. Cuttings.

Bland Fig-Marigold. (*M. blandum*.) Flowers in June, in sandy loam. Cuttings.

Coral Fig-Marigold. (*M. corallinum*.) Flowers in May and June, in sandy loam. Cuttings.

Aiton's Fig-Marigold. (*M. Aitoni*.) Flowers in June and October, in sandy loam. Cuttings.

Heart-leaved Fig-Marigold. (*M. cordifolium*.) Flowers in May and September, in sandy loam. Cuttings.

Bundle-flowered Fig-Marigold. (*M. floribundum*.) Flowers in May and October, in sandy loam. Cuttings.

Crassula-like Fig-Marigold. (*M. crassuloides*.) Flowers in July and August, in sandy loam. Cuttings.

Rush-leaved Fig-Marigold. (*M. junceum*.) Flowers in August and October, in sandy loam. Cuttings.  
Slender-flowered Fig-Marigold. (*M. tenuiflorum*.) Flowers in July and November, in sandy loam. Cuttings.

Star-bearing Fig-Marigold. (*M. stelligerum*.) Flowers in May and October, in sandy loam. Cuttings.  
Truncate Epiphyllum. (*Epiphyllum truncatum*.) Flowers in June, in sandy loam. Cuttings.

## PURPLE.

Purpurascient Aloe. (*Aloe purpurascens*.) Flowers in July and October, in sandy loam. Suckers.  
Oblique Fig-Marigold. (*Mesembryanthemum obliquum*.) Flowers in August, in sandy loam. Cuttings.  
Small-leaved Fig-Marigold. (*M. par-*

*vifolium*.) Flowers in August, in sandy loam. Cuttings.  
Hispid Fig-Marigold. (*M. hispidum*.) Flowers in May and October, in sandy loam. Cuttings.  
Sub-compressed Fig-Marigold. (*M. subcompressum*.) Flowers in July and August, in sandy loam. Cuttings.

## SCARLET.

Perfoliate Rochea. (*Rochea perfoliata*.) Flowers in July and August, in sandy loam. Cuttings.  
Scarlet Kalosanthes. (*Kalosanthus coccinea*.) Flowers in June and August, in sandy loam. Cuttings.  
Small scarlet Crassula. (*Crassula coccinella*.) Flowers in July, in sandy loam. Cuttings.  
White-spined Aloe. (*Aloe albispina*.) Flowers in June and July, in sandy loam. Suckers.  
Lined Aloe. (*Aloe lineata*.) Flowers in August, in sandy loam. Suckers.  
Panicked Aloe. (*Aloe paniculata*.) Flowers in July, in sandy loam. Suckers.  
Suberect Aloe. (*Aloe suberecta*.) Flowers in March and June, in sandy loam. Suckers.  
Fair Gasteria. (*Gasteria pulchra*.) Flowers in June and August, in sandy loam. Cuttings.  
Painted Gasteria. (*Gasteria picta*.) Flowers in July and August, in sandy loam. Suckers.  
Beautiful Gasteria. (*Gasteria formosa*.) Flowers in July and August, in sandy loam. Suckers.  
Netted Gasteria. (*Gasteria retata*.) Flowers in July and August, in sandy loam. Suckers.  
Sulcated Gasteria. (*Gasteria sulcata*.) Flowers in July and August, in sandy loam. Suckers.  
Ridged Gasteria. (*Gasteria strigata*.) Flowers in July and August, in sandy loam. Suckers.  
Lively-spotted Gasteria. (*Gasteria latipunctata*.) Flowers in July and August, in sandy loam. Suckers.  
Shining Gasteria. (*Gasteria nitans*.)

Flowers in July and August, in sandy loam. Cuttings.  
Lovely Gasteria. (*Gasteria venusta*.) Flowers in July and August, in sandy loam. Suckers.  
Many-dotted Gasteria. (*Gasteria pluripunctata*.) Flowers in July and August, in sandy loam. Suckers.  
Smeared Gasteria. (*Gasteria limitata*.) Flowers in July and August, in sandy loam. Suckers.  
Scarlet-flowered Fig-Marigold. (*Mesembryanthemum coccineum*.) Flowers in May and September, in sandy loam. Cuttings.  
Slender-leaved Fig-Marigold. (*M. tenuifolium*.) Flowers in June and September, in sandy loam. Cuttings.  
Specious Fig-Marigold. (*M. speciosum*.) Flowers in May and October, in sandy loam. Cuttings.  
Glittering Fig-Marigold. (*M. micans*.) Flowers in May and October, in sandy loam. Cuttings.  
Lance's Cereus. (*Cereus Lanceanus*.) Flowers in April and June, in sandy loam. Cuttings.  
Scarlet Cereus. (*Cereus coccineus*.) Flowers in May and June, in sandy loam. Cuttings.  
Jenkinson's hybrid Epiphyllum. (*Epiphyllum Jenkinsoni*.) Flowers in July and August, in sandy loam. Cuttings.  
Makoy's hybrid Epiphyllum. (*Epiphyllum Makoyi*.) Flowers in July and August, in sandy loam. Cuttings.  
Smith's hybrid Epiphyllum. (*Epiphyllum Smithii*.) Flowers in August and September, in sandy loam. Cuttings.



Vande's Hybrid Epiphyllum. (*Epiphyllum Vandesii*.) Flowers in August and September, in sandy loam. Cuttings.

Kiard's Hybrid Epiphyllum. (*Epiphyllum Kiardi*.) Flowers in July and August, in sandy loam. Cuttings.

Ackerman's Epiphyllum. (*Epiphyllum Ackermanni*.) Flowers in July and August, in sandy loam. Cuttings.

Scarlet Epiphyllum. (*Epiphyllum coccineum*.) Flowers in July and August, in sandy loam. Cuttings.

## ORANGE.

Bastard African Pachidendron. (*Pachidendron pseudo-africanum*.) Flowers in March and November, in sandy loam. Suckers.

Above-smooth Pachidendron. (*Pachidendron superlave*.) Flowers in July and August, in sandy loam. Suckers.

Slender Aloe. (*Aloe gracilis*.) Flowers in June and July, in sandy loam. Suckers.

Yellow-spined Aloe. (*Aloe xanthacantha*.) Flowers in June, in sandy loam. Suckers.

Flat-leaved Aloe. (*Aloe depressa*.) Flowers in August, in sandy loam. Suckers.

Short-leaved Aloe. (*Aloe brevifolia*.) Flowers in June and July, in sandy loam. Suckers.

Proliferous Aloe. (*Aloe prolifera*.) Flowers in March and June, in sandy loam. Suckers.

White-edged Aloe. (*Aloe albocincta*.) Flowers in June, in sandy loam. Suckers.

Acuminate Aloe. (*Aloe acuminata*.) Flowers in March and May, in sandy loam. Suckers.

Humble Aloe. (*Aloe humilis*.) Flowers in March and June, in sandy loam. Suckers.

Glaucous-leaved Fig-Marigold. (*Mesembryanthemum glaucum*.) Flowers in June and July, in sandy loam. Cuttings.

Two-coloured Fig-Marigold. (*M. bicolorum*.) Flowers in May and September, in sandy loam. Cuttings.

Unequal-cupped Fig-Marigold. (*M. inaequale*.) Flowers in May and September, in sandy loam. Cuttings.

Tile-coloured Fig-Marigold. (*M. testaceum*.) Flowers in August and September, in sandy loam. Cuttings.

Tuberous-rooted Fig-Marigold. (*M. tuberosum*.) Flowers in June and October, in sandy loam. Cuttings.

## GREY.

Neat Haworthia. (*Haworthia concinna*.) Flowers in July and September, in sandy loam. Suckers.

Heart-leaved Haworthia. (*Haworthia cordifolia*.) Flowers in May and July, in sandy loam. Suckers.

Twisted Haworthia. (*Haworthia tortuosa*.) Flowers in May and September, in sandy loam. Suckers.

Shining Haworthia. (*Haworthia nitida*.) Flowers in July, in sandy loam. Suckers.

Expanded Haworthia. (*Haworthia expansa*.) Flowers in July and November, in sandy loam. Suckers.

Hybrid Haworthia. (*Haworthia hybrida*.) Flowers in June and July, in sandy loam. Suckers.

Many-sided Haworthia. (*Haworthia multifaria*.) Flowers in June and July, in sandy loam. Suckers.

Papillose Haworthia. (*Haworthia papillosa*.) Flowers in May and August, in sandy loam. Suckers.

Erect-pearl Haworthia. (*Haworthia*

*erecta*.) Flowers in August, in sandy loam. Suckers.

Half-smoothed Haworthia. (*Haworthia simiglabrata*.) Flowers in May and August, in sandy loam. Suckers.

Attenuated-pearl Haworthia. (*Haworthia attenuata*.) Flowers in May and August, in sandy loam. Suckers.

Reinwart's-pearl Haworthia. (*Haworthia Reinwartii*.) Flowers in June and July, in sandy loam. Suckers.

Virescent Haworthia. (*Haworthia virescens*.) Flowers in August and September, in sandy loam. Suckers.

Cobweb-like Haworthia. (*Haworthia arachnoides*.) Flowers in August, in sandy loam. Suckers.

Transparent Haworthia. (*Haworthia translucens*.) Flowers in May and August, in sandy loam. Suckers.

Bristle-leaved Haworthia. (*Haworthia setata*.) Flowers in July and August, in sandy loam. Suckers.

- Pale-green Haworthia. (*Haworthia pallida*.) Flowers in June and July, in sandy loam. Suckers.
- Dark-green Haworthia. (*Haworthia atrovirens*.) Flowers in May, in sandy loam. Suckers.
- Green-spined Haworthia. (*Haworthia chloracantha*.) Flowers in August, in sandy loam. Suckers.
- Narrow-leaved Haworthia. (*Haworthia angustifolia*.) Flowers in June, in sandy loam. Suckers.
- Boat-formed Haworthia. (*Haworthia cymbiformis*.) Flowers in May and August, in sandy loam. Suckers.
- Awned Haworthia. (*Haworthia aristata*.) Flowers in July, in sandy loam. Suckers.
- Cuspidate Haworthia. (*Haworthia cuspidata*.) Flowers in August, in sandy loam. Suckers.
- Denticulate Haworthia. (*Haworthia denticulata*.) Flowers in August, in sandy loam. Suckers.
- Great-spiral Apicra. (*Apicra spiralis*.) Flowers in August and September, in sandy loam. Suckers.
- Little-blistered Apicra. (*Apicra bulbulata*.) Flowers in August, in sandy loam. Suckers.
- Five-angled Apicra. (*Apicra pentagona*.) Flowers in June and July, in sandy loam. Suckers.
- Rough Apicra. (*Apicra aspera*.) Flowers in April and May, in sandy loam. Suckers.
- Double-keeled Apicra. (*Apicra bicarinata*.) Flowers in June, in sandy loam. Suckers.
- Rough-black Apicra. (*Apicra nigra*.) Flowers in July, in sandy loam. Suckers.
- Imbricated Apicra. (*Apicra imbricata*.) Flowers in June and July, in sandy loam. Suckers.
- Small-leafy Apicra. (*Apicra foliosa*.) Flowers in June and August, in sandy loam. Suckers.
- Rigid Apicra. (*Apicra rigida*.) Flowers in April and May, in sandy loam. Suckers.

## CRIMSON.

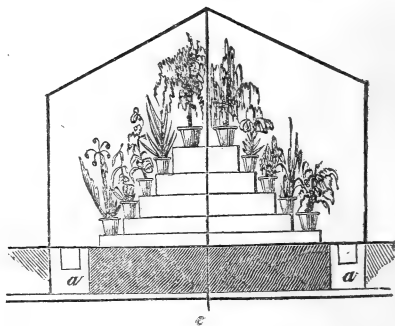
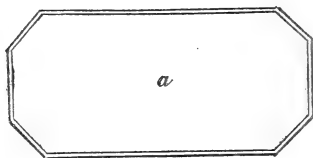
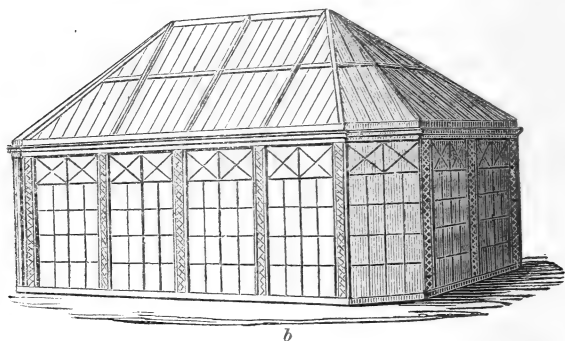
- Showiest Cereus. (*Cereus speciosissimus*.) Flowers in July, in sandy loam. Cuttings.

## WHITE AND GREEN.

- Napoleon's Cereus. (*Cereus Napoleonis*.) Flowers in July and August, in sandy loam. Cuttings.

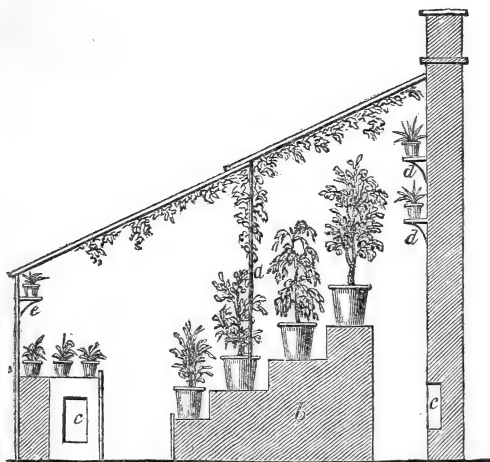


or two examples calculated for general purposes. The most suitable description of greenhouse which is to stand on a lawn, in the flower garden, as a detached object, is one whose sides and ends are glazed, because, if otherwise constructed, the deformities of the back would be with difficulty concealed, and it would under all circumstances have a very bad effect. A greenhouse constructed upon a plan similar to that shown in the annexed diagram would be an elegant object, seen from any part



of the garden. The form, as shown in the ground plan, *a*, to be a lengthened parallelogram, having the corners cut off. The elevation, as shown at *b*, will be light and elegant, and the cross section at *c* will show the internal arrangement, viz., the stage for the plants, surrounded by a walk on all sides, and heated by hot water, or smoke flues, as at *a a*, the pipes or flues carried round the house under the pavement of the footpath, and the heat to ascend through ventilators fixed in the floor, by which means it can be retained in or allowed to ascend from the chamber in which the pipes or flues are placed. The front and end lights of this house to be taken away at pleasure, and two of the uppermost tier of the roof sashes made moveable, so as to slide down for the purpose of ventilation.

The most common form and arrangement of the best greenhouses which are built against walls, is that of the annexed figure, and these answer

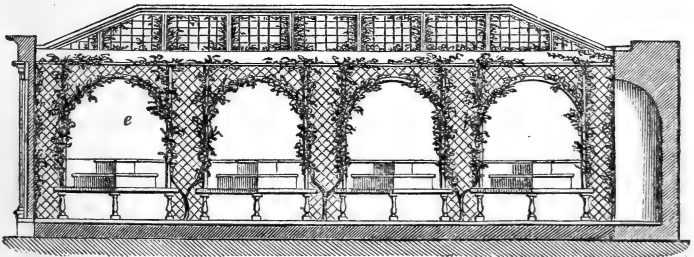


every purpose of cultivation. The arrangement of such a house is this :—the roof is composed of two lights, and is supported by cast-iron uprights, *a*, placed under every second rafter, and the intermediate rafter is supported by means of a semicircular iron bar, which, springing from

the upright bar on each side, passes close under it, and indeed is screwed to it, by which means the whole roof is tied together, and scope afforded for the training of climbing plants to the bars. The stage, *b*, is in the middle of the house, allowing a footpath all round, and the heat is communicated by means of the flues *c*, which pass down the front and return along the back. Shelves are fixed against the back wall *d* for holding plants in a state of rest, that they may be kept dry, and a small shelf, *e*, is also placed in front, immediately under the bottom of the rafters, for the reception of small, young, or delicate plants, particularly during winter. Over the front flue is a trellis-table, also for small plants and such as require abundance of air and light.

Many fantastic and badly arranged greenhouses have been erected, and, as it would appear, for no other purpose than that of creating forms that imagination only can approve of, and to have a house different from all others, and too often contrary to both reason and good taste. Nicol, a garden architect of some pretensions, appears to have understood the rationale of building greenhouses upon very judicious principles. He agrees with us that a house to stand detached from other buildings should be of glass on all sides. "It may be a circular, oval, hexagonal, octagonal, or with two straight sides and circular ends, which," he thinks, "the best form of any: the next best an octagon, whose sides are not equal, but with two opposite longer sides, and six shorter sides. In either of these last-mentioned forms, the stages and plants may," at least in his mind, "be more tastefully arranged than in any other. Granting either of these cases, the house should be about thirty-six or forty feet long, eighteen or twenty feet wide, and ten, or at most twelve, feet high, above a level line for its floor. The parapet all round to be a foot or fifteen inches high, and the upright glasses placed on it four, or four and a half feet at most; for it is important, for the sake of the finer kinds of plants, and in order to have all kinds grow bushy, and flower while young and small, to keep the roof glasses as low as possible, just allowing sufficient head room for the tallest person when walking in the alleys. The furnace and stock-hole may be placed at either end, or at either side, as may be most convenient; and they should be sunk under ground and concealed. The flues to be constructed should run parallel to, and be separated from the parapet by a three-inch cavity; its surface being level with the top of the parapet, and being cribs-trellised for heaths, or other rare plants. A walk thirty or thirty-six inches broad to be conducted all round next the flues, within which should be placed the stages for the more common and the taller plants, being raised in the middle and

falling to either side or end, corresponding with the glasses, but of course not so steep. A row of columns should be placed in the centre, in order to support the ridge of the roof, to which climbing plants may be trained in various forms, and may be hung in festoons from column to column, or otherwise, as may be dictated by fancy. The front of the stage all round should be elevated about eighteen or twenty inches above the walk, in order to raise the whole of the plants placed on it sufficiently near the glass. The aspect of such a house should be towards the south, that is to say, it should stretch from east to west, or as nearly so as circumstances will admit. It may have an entrance at the south side, or one at either end, as shall be most convenient and suitable. If a greenhouse must necessarily be attached to a wall or other building, it might be constructed very much as above, with the difference only of having one of the ends, as it were, cut off, in which case it should be placed with its circular end south, or towards that point, and the sides pointing east and west. This I should consider," says this intelligent author, "as the second best constructed greenhouse, and in which, excepting in the above described house, the plants would enjoy the fullest share of sun and light." In regard to the space that one well-directed fire, whether applied through smoke-flues or hot water, will heat sufficiently for the purpose of the greenhouse, we may state that from various experiments it appears that from four to five thousand cubic feet of air, that is, of the internal capacity of a greenhouse, may be completely heated by one fire.



Greenhouses in which a miscellaneous collection of plants are to be cultivated, may be, as we have already observed, of various forms and

constructions. The following description and accompanying diagram will pretty well elucidate a plant structure, combining the style of the conservatory with that of the greenhouse : such a one exists in the garden of the late Sir Robert Preston, of Valleyfield, in Perthshire ; the chief advantages of which are, that the plants are placed upon stages of an angular form, and are placed so as to intersect each other, yet allowing sufficient space for a person to walk between them, either to view or to water the plants. By this mode of arrangement it will be seen, that a greater surface is exposed to the light and air than in the usual form of stages and mode of arrangement, and as the house fronts the south, there is no part of these stages that does not enjoy its proper share of the sun and air.

#### GENERAL TREATMENT OF MISCELLANEOUS GREENHOUSE PLANTS WHILE YOUNG.

Of the plants that form the majority of those genera enumerated at the beginning of this article, many of them seed freely, and may be in that way readily propagated : others strike by cuttings, by the means most generally in use, and a few are propagated by other means, which will be noticed under their respective heads.

To propagate greenhouse exotics upon a large scale requires a house to be set apart for the express purpose, and nurserymen have in general such a house. The great utility of such an arrangement is to have an atmosphere created for the purpose, in which the greatest uniformity of temperature and humidity can be attained. Propagation upon a more limited scale may be successfully carried on in a close frame or pit, and upon the smallest scale of all by placing one or more hand-glasses in a convenient part of the greenhouse, under which the pots in which the cuttings are planted should be placed.

#### PROPAGATION BY SEEDS.

We have already remarked, when treating of bulbous plants, that seeds ripened before Midsummer may be sown immediately, and will, in most cases, produce plants strong enough to stand the succeeding winter ; but such as ripen after that period had better be reserved till spring, and sown in February or March.



In well-drained pots filled with peat and loamy soil, the majority of greenhouse plants may be sown, covering them in proportion to the size of the seeds ; and if the quantity to be sown be small, two, three, or four sorts may be sown in one pot, divided in proportions for them. In such cases care must be taken that each be labelled properly ; and the best way is, when more than one sort is sown, to place the labels in the centre of the pot with the names or numbers facing outwards. When the seeds are sown they should be watered with the finest rose-watering pot, and placed in a cool, rather shaded part of the greenhouse, or cold pit, and attended to in respect to regular watering and weeding.

#### PROPAGATION BY CUTTINGS.

Most greenhouse plants of the genera enumerated at the beginning of this article may be increased by this means. The best time for this purpose is that when the plants are in a proper state, either in respect to ripened wood, young wood, or wood of an intermediate state, for in all these stages of growth is it used for different plants. As it is of some importance that propagation be commenced as early in the season as possible, because cuttings do not succeed so well during the heat of summer as in the spring months, it may be necessary in many cases, where young wood is required for this purpose, and where it does not exist on the plant sufficiently early, to place those from which the cuttings are to be taken in the stove, hot-bed, frame, or other warm situation, for a week or two prior to the time of taking them off, which ranges from the end of February till the end of April. In situations where circumstances will not admit of forwarding the plants with heat, then the season of taking off the cuttings must be made subordinate to it, that is, they are to be taken off when they naturally arrive at a proper size : of course the success will be in proportion. May and June will, therefore, be the time for propagating by this latter method, for by that period the plants will have made wood naturally fit for the purpose. Pots for cuttings should be well drained, and filled as near the surface with peat and loam as it is calculated the cuttings will be inserted, or rather a little deeper. For it is of importance to almost all these plants to be struck in pure sand, but that the roots when they have begun to form should have a soil more congenial to their nature to live in ; when this is not attended to, many cuttings after they have struck root actually die off from want of sustenance ; and to guard against this many cultivators take the cuttings out

of the sand altogether when they have nearly rooted, and plant them in soil natural to the plant. The sand being properly moistened with water, and pressed tight down in the pot and made as level on the surface as possible, is then ready for the reception of the cuttings.

In preparing the cuttings, much depends on the habits of the plants, as some require to be of greater length than others, varying from half an inch to three or four inches in this respect. As a rule from which there are very few exceptions, we may say that most cuttings should be taken off at their second, third, or fourth joint from the top, and that the base of the cutting be exactly under one of these joints. No more leaves should be taken off than would be buried in the sand, and these should be cut closely off, with a sharp knife; but care must also be taken that the stem be not injured in the operation. It was an old and very erroneous practice, and one which no sensible cultivator will now follow, to cut off more or less of all the leaves of cuttings. Nothing could be worse than this, because by so doing the respiration of the cutting was destroyed, and with it to a great extent the chance of success in propagating it.

When the cuttings are planted and watered they should be set in the propagation-house, frame, or under the hand-glasses, as above recommended. If in a properly managed propagating-house, bell-glasses will be seldom necessary, nor will they either in a close pit or frame; but in all situations where the air has full action round them, then glasses are indispensably necessary. Some cultivators place most of their greenhouse cuttings in a cool place to root, while others are equally successful by placing most of them in a mild bottom heat. The advantage of the former is, that it is more economical and convenient; and of the latter that it is the most expeditious, and the merits of both are just in proportion to the attention that is paid to making and planting the cuttings properly, watering, shading, and hardening them off when rooted. The back or front of a common cucumber frame is an excellent place for striking cuttings in of most of these species when heat is to be applied; but both in this case and also in that when heat is dispensed with, great care must be taken that damp be as much as possible excluded; and this is only to be effected by a daily examination of them, and by keeping the glasses clean and dry, and removing decayed leaves when they appear.

Cuttings put in in February, March, or April will in most cases, if soft-wooded plants, be rooted in April, May, and June, and fit to be potted off into small pots singly. The hard-wooded cuttings put in at the same periods will be longer in attaining that state, but will be sufficiently so by the

end of summer, and all fully established to stand the winter in the greenhouse. Some cuttings put in late in summer, and some even of those put in late in spring, may not root during the season: these should be kept during the winter in a dry airy place in the greenhouse, for most of them will root and grow freely on the commencement of spring.

The article PROPAGATION BY CUTTINGS in the *Ency. of Gard.*, p. 659, is written in a manner so consistently philosophical, that we cannot refrain from making the following quotation:—"The insertion of cuttings may seem an easy matter, and none but a practical cultivator would imagine that there could be any difference in the growth between cuttings inserted in the middle of a pot and those inserted at its edges. Yet such is actually the case; and some sorts of trees, as the orange, *Ceratonia*, &c., if inserted in a mere mass of earth, will hardly, if at all, throw out roots, while, if they are inserted in sand, or in earth at the sides of the pots, so as to touch the pot in their whole length, they seldom fail in becoming rooted plants.

"The management of cuttings after they are planted depends on the general principle, that when life is weak all excesses of exterior agency must have a tendency to render it extinct. No cuttings require to be planted deep, though such as are large ought to be inserted deeper than those that are small. In the case of evergreens, the leaves should be kept from touching the soil, otherwise they will damp or rot off; and in the case of tubular-stalked plants, which are in general not very easily struck, owing to the water lodging in the tube, and rotting the cutting, both ends may in some cases (as in common honeysuckles) be advantageously inserted in the soil, as, besides a greater certainty of success, there is a chance that two plants may be produced. Too much light, air, water, heat, or cold, are alike injurious. To guard against these extremes in tender sorts, the best means hitherto devised is that of enclosing an atmosphere over the cuttings by means of a hand or bell glass, according to their delicacy. This preserves a uniform stillness and moisture of atmosphere. Immersing the pot in earth (if the cuttings are in pots) has a tendency to preserve a steady, uniform degree of moisture at the roots, and shading, or planting the cuttings, if in the open air, in a shady situation, prevents the bad effects of an excess of light. The only method of regulating the heat is by double or single coverings of glass, or mats, or both. A hand-glass placed over a bell-glass will preserve, in a shady situation, a very constant degree of heat. What the degree of heat ought to be is generally decided by that which is requisite for the mother plant. Whatever degree of heat is natural to

the mother plant when in a growing state will, in general, be most favourable for the growth of the cuttings. There are, however, some variations, amounting nearly, but not quite, to exceptions. Most species of *Erica*, *Georgina* (*Dahlia*), and *Pelargonium*, strike better when supplied with rather more heat than is requisite for the growth of these plants in greenhouses. The *Myrtle* tribe and *Camellias* require rather less, and in general it may be observed, that to give a lesser portion of heat, and of every thing else proper for plants in their rooted and growing state, is the safest conduct in respect to cuttings of ligneous plants. Cuttings of deciduous hardy trees taken off in autumn should not, of course, be put into heat till spring, but should be kept dormant, like the mother tree."

Newly potted off cuttings, which by the way should be put into very small pots, should be carefully shaded, and not too soon exposed to the air; those that are drawn or have run up tall or weak, should be topped, that they may begin to grow stocky, which if neglected at the beginning cannot be well rectified afterwards. Occasional shiftings will be necessary as they advance in growth, but this can only be correctly determined by frequently examining the state of their roots, by turning them out of the pots.

#### GENERAL TREATMENT OF GREENHOUSE PLANTS WHEN OUT OF DOORS.

The majority of the genera which we have classed under the above head may with perfect safety be placed in the open air from the middle of June till the earlier part of September. The advantage they derive from this mode of culture is, that they can enjoy a greater share of room, air, light, and the genial rains and dews of summer. There are a few genera, however, in our enumeration, that will be better kept in the house during the whole season, and these are *Pimelea*, *Protea*, *Chironia*, *Roella*, *Anthocercis*, *Clerodendron*, and *Lechenaultia*. The situation best adapted for the summer residence of greenhouse plants is one that is dry, not over shaded, and sheltered from the winds. A dry-compost floor of gravel or coal ashes is the best to stand them on, but they should not be plunged in any medium excepting either coarse stony gravel, or various species of moss, either of which will admit of the superfluous water passing off through them, which plunging in the ground would not do. Besides, if such plants were plunged in the ground, their roots would escape through the bottom of the pots and shoot downwards, thus causing an exceeding

grossness of character in the plant, which would be any thing but desirable. When these plants are placed out they should be secured to laths, cords, or wires, fastened so that the plants may be individually attached to them to prevent their being blown down or broken. Regularity in watering should be attended to, and during the hottest weather scarcely too much can be given to them at the roots, and occasionally a slight syringing may be applied over their tops, to moisten, refresh, and clean the foliage and branches.

Sometimes greenhouse plants are set or plunged during summer in the borders of the flower-garden, and sometimes in the shrubbery, or as single specimens on the lawn. The objection to the two former modes is, that they cannot from their limited number and want of size produce any extra effect in these situations, and indeed in good taste they cannot be said to be in character or keeping with the foliage and forms around them. Fine specimens of large grown exotics may be admissible on the lawn, because, like vases, urns, statues, &c., these are evidently placed there as individual ornaments of decoration.

Worms are often very troublesome and even injurious to exotics when set out of doors; they may be completely prevented or destroyed by watering the ground on which the plants are placed before they are brought out, and occasionally afterwards. Neither will the most delicate exotic suffer from the same application being made to its roots.

#### GENERAL TREATMENT OF GREENHOUSE PLANTS WHEN IN THE HOUSE.

From the middle of September till the end of October is the proper time for taking in exotic plants, but of course this depends much upon the season; in fine dry autumns they may be kept out till the end of October, while in wet, cold ones they should be all housed by the end of September. Of course they need not all be taken in at the same time; the more tender and soft-wooded first, and the more robust and hard-wooded ones last of all.

Previous to taking the plants into the house, the necessary repairs, such as painting, repairing the glass, cleaning the flues when they are used, &c., should be finished. The plants should then be gone over and carefully examined to see that the drainage is in a proper state, which is done by examining the holes in the bottom or sides of the pots, and taking away any mould or filth that may have accumulated in them, or by turning them out, which can readily be done, particularly with the smaller sized ones.

The surface of the mould should be regulated, cleared of moss or weeds, and a fresh top surface laid over it. The pots should be all well cleaned on the outside, even by washing, and the plants fresh staked, tied in, and pruned of luxuriant or straggling branches. When this is completed, they may be taken in and arranged upon the stages, but set as wide apart as possible, so that the air may circulate freely among them.

The front lights, when they have been removed from the greenhouse, should not be for a few weeks fixed in their places, as it is an object of much consequence that as great a supply of air as can be admitted be allowed to circulate through them. It is seldom that the frosts of the early part of autumn are so severe as to injure greenhouse plants not immediately exposed to their vertical effect. By the middle of November, unless unusually severe frost occur, the front and end sashes may be replaced, and ventilation carried on by the usual means of opening and shutting them morning and evening. What gardeners usually call *ripening the wood*, that is, inducing a habit of close, short jointed branches to form, but not too luxuriant ones, should be attended to, and which is, as far as regards the sort of plants under consideration, easily effected by shortening the strong branches to cause them to send out many smaller ones, and by allowing them plenty of room to stand on, as well as abundance of air when first taken into the house. By getting plants into this habit, they will flower much finer, be less liable to sustain injury during winter, and be in general appearance much superior to those which are allowed to grow in a rambling and luxuriant manner.

Damp must be repelled by occasional fires, to be applied during the day when ventilation can be fully used, and frost by the same means during night. We have elsewhere observed that these plants are oftener injured by having too much fire heat given them than by a want of it. Few greenhouse plants will suffer from cold in a well-glazed house until the thermometer fall to about thirty-seven degrees, and never should the temperature be raised above forty-eight degrees by artificial means. But in all greenhouses, if this temperature can be kept up without fire heat, by means of covering, &c., so much the better.

Plants when first brought into the house should have abundance of water, as they are then deprived of the humidity that they would absorb from the damp ground they stand on during summer, and also of the dews at night and occasional showers. But this element should be gradually withdrawn from them afterwards, and no more given them during winter than to keep them in good health. All unnecessary waste

of water, either in the pots or by being spilt on the floor, should be guarded against, as it has a great tendency to create damp, which, settling on the leaves, would be very injurious to them, and cause many of them to fall off, and endanger most of the herbaceous and soft-wooded sorts, which are liable under all cases to rot off. All dead leaves should be picked off as they appear, and the plants often turned, so that all sides of them may enjoy an equal share of light.

Towards spring the plants should be all gone over, supporting such as require it, clearing the surface of the mould in the pots, examining them in respect to drainage, &c. About the beginning of February air must be again freely admitted during all fine days, and this must be increased as the season advances, until the lights can be left partly open during the night, and finally removed altogether. As air is increased, so should water also in the same proportion.

During spring, some plants may require to be shifted into larger pots : when this is apparent, the operation must by no means be put off till the general shifting takes place, but be done immediately. Shifting at this period may be necessary from two causes, viz., to increase the size of the plant when such is desirable, and when the mould, from imperfect draining or other causes, gets too much saturated with moisture. In regard to watering at all seasons, there is one rule that should not be departed from, namely, that the plants be permitted to become partially dry before water be applied to them, because, when kept continually wet, the mould loses that active quality which is so necessary to vegetation, and the plant, as Cushing justly observes, in consequence "will assume a very unhealthy appearance, which many might not perhaps attribute to the proper cause."

The arrangement of plants in greenhouses appears to be but little understood ; the old practice of placing them indiscriminately upon the shelves of the stage, keeping in view only the end of having a regular sloping bank of foliage, without, as it were, one leaf being allowed to stand higher than its neighbour, is most absurd. At the same time we are aware, that from the materials to be operated upon, and the size of the field of operation, little can be effected in giving a picturesque character to the mass ; nor do we think this absolutely necessary. But one thing we know to be certain, that many a valuable plant is destroyed because it happens, from sheer neglect on the part of the cultivator, that it may have run up with a naked stem, having only a few leaves at the top, or it may have, from neglect or accident, become less vigorous and handsome in its appearance than many robust plants around it : such a plant

as this is too often, however rare, thrust in some out-of-the-way part of the house, quite out of sight. Now, such a plant, from being in a sickly state, should be either cut down in spring and allowed to form itself anew, or brought into the most favourable part of the house, to be nursed into better health. Again, many plants that naturally require abundance of light, the genus *Protea*, for example, are often placed behind coarser and common-place plants, that could themselves stand during the season under the shade of others. If we take our observations from nature, we see that there are plants of shade, and others that affect the sun. There are the same rules observed throughout the whole vegetable kingdom, and in no instance will deviation from this rule be observed but under the cultivating hand of man. Plants ought to be placed according to their several natures ; and this is one of many reasons which has induced us to sketch out the arrangement in their cultivation, which we have endeavoured to elucidate in these pages.

We see no impropriety in bringing the several genera cultivated in a MIXED GREENHOUSE into groups by themselves. For example, the family *Polygala* in one group, *Acacia* in another, *Gnidia* in a third, and so on. The effect would be both systematic and pleasing, and the advantages to the cultivator many, because he could at one glance see his stock of each genus and species, giving them excess of water, or the reverse, according to circumstances ; and at the same time any peculiar feature in the management could be better attended to than if they were scattered all over the house.

#### SOIL.

The majority of greenhouse plants which come under the present head will flourish to the utmost perfection in a soil composed of half light turfy sandy loam and peat earth. Some few, such as *Protea*, prefer a rich loam of a middling texture, and others, such as *Pimelea*, *Roella*, *Lechenaultia*, prefer a sandy peat alone. The fresh soil of a properly selected piece of uncultivated land, having abundance of fibrous vegetable matter contained in it, should be preferred. All garden mould, or that which has been under a state of cultivation, should be carefully rejected.

#### SHIFTING OR POTTING.

Enough has been already said upon this subject, under the various heads already noticed, to render any lengthened description of the process unnecessary here ; we will only refer to what has been said on the subject,



and state that all greenhouse plants should be shifted at least once a year, many of them oftener, according to their habits of growth or the purpose for which they may be intended. There is one very general and very great fault in shifting plants, and that is, placing them in too large pots, nor is this a subject that any written directions can explain or rectify. We know of no other rule that can be at all considered as bearing on the case, or that we have words to explain, other than proportioning the size of the pot to the number, size, and form of the roots. Thus a heath, or Azalea, requires a much less pot to grow in than a *Pæonia* or *Fuchsia* of the same size, and such plants as *Chrysanthemum*, *Calceolaria*, &c., that require to be grown rapidly to increase the number and size of their flowers, and also those being only herbaceous, that is, producing a fresh volume of herb annually, require much larger pots than the slender-rooted *Selago*, or *Chironia*. Instead of calculating by the size, number, or nature of the roots, it is too general a practice to calculate by the size of the plant only.

## AZALEA.

The Chinese varieties of this splendid genus strike by cuttings of the young wood taken off close to the ripened shoots, planted in sand, and placed under a bell-glass in a mild bottom heat. The best soil for grown up plants is a sandy turfy peat, and the best situation the most sunny while in the greenhouse, till after they flower, when they may be placed out of doors, but not in an exposed place. They must be kept in a cool pit during winter, and taken into the house in February or March, to produce their flowers.

## INDIGOFERA.

This genus seeds freely, from whence young plants may be obtained, the seeds to be sown as soon as ripe. They also increase by cuttings, planted in sand and placed in a cool situation. The best soil for them is light sandy loam and peat, the larger proportion of the latter.

## PIMELEA.

Cuttings of the young wood root freely, planted in sand and placed upon a slight warmth without bell-glasses. They often seed abundantly, and in this case should be sown in fine sandy peat soil, slightly covered, and placed in a cool situation near the glass. Sandy peat with a portion of vegetable fibre is the best soil for them.

## POLYGALA.

This fine-flowering genus requires the same soil and treatment as the last.

## CHIRONIA

Is propagated by cuttings taken off in spring, planted in sand, and covered with a bell-glass in a cool situation. A light sandy loam and peat is the most suitable for them.

## PROTEA.

This fine genus has been subdivided into various new genera. The species which are natives of the Cape of Good Hope are almost all splendid when in flower, but it is to be regretted that so few of them are at present to be found in our gardens. The late collectors, Niven and Mason, sent many species to the Kew garden, and also to the Hammer-smith nursery, but in both collections few of them are now to be seen. A rich loamy soil is suitable to the majority of them. They are very difficult to increase by cuttings, but seeds of them can be readily obtained from the Cape, and occasionally they ripen seeds in this country.

## ROELLA

Is multiplied by cuttings of the young wood, planted in sand and placed on a slight heat under a glass. The grown-up plants prefer a sandy peat alone, and small pots.

## SALVIA.

No genus of plants strikes more freely, or is grown with less trouble.

## SELAGO.

The young shoots root freely in sand, under a glass, in a cool place. Light loam and peat, of each equal parts, will grow them to perfection.

## SWANSONIA.

Seeds are readily produced, and vegetate freely if sown in peat and loam. Cuttings root with little difficulty, but seedlings make the best plants.

## ACACIA.

This numerous and free-flowering family do not readily increase by cuttings, but full-grown specimens seed abundantly. *A. pubescens*, one of the most splendid of the family, is increased by cuttings of the roots, which should be planted in peat and loam, and placed in a mild, moist temperature. Seeds are occasionally produced. But the facility of procuring seeds of most of the genera from New Holland renders these plants plentiful in our gardens.

## ANTHOCERCIS.

Cuttings of the half-ripened shoots, planted in sand, root when placed in a cool situation, and sometimes those of the young shoots also succeed when placed in a slight heat, covered with a bell-glass. It is by no means a genus that is rapidly propagated, nor is it without care that the plants will live long. The most airy situation in the greenhouse is the best for them.

## GENISTA, GOODIA, PODALYRIA, AND CROTALARIA,

Will all strike by cuttings of the young wood, planted in sand, and kept cool; but the best method of increasing them is by seeds, which they produce freely when the plants are full-grown. These should be sown in peat and loam, the soil they prefer when full-grown.

## GNIDIA.

This genus is easily propagated by cuttings of the young wood, planted in sand, and placed under a glass. The soil they prefer is light loam and peat.

## LINUM.

The shrubby species of this genus root freely from cuttings of the young wood, and the herbaceous or soft-wooded kinds produce seeds freely, which should be sown in peat and loam, the soil the plants thrive best in.

## CALCEOLARIA.

The shrubby species and varieties of this fine-flowering tribe root

readily by cuttings planted in finely-sifted, light, rich mould, and the herbaceous sorts divide at the roots, and both produce seeds which vegetate freely if sown on the surface of pots of fine, light, rich mould, in February. When they have vegetated, as soon as they will move, the seedlings should be planted out into other pots, and kept in a very slight heat to forward them. By the latter end of May or the beginning of June they will be fit to plant out into a rather cool shaded border, when they will flower till the end of autumn. From these the finest varieties should be selected, potted in autumn, and kept in a cool pit or greenhouse during winter, when they will flower beautifully the following summer. Cuttings taken off in autumn, and kept in a dry, airy place, where frost is merely excluded, if potted into larger pots in spring, will also flower in great perfection during summer. The whole family is very subject to the attacks of green-fly: when that is observed, recourse must be had to the fumigation of tobacco, and a slight syringing over their tops the day following. The shrubby sorts are so hardy that they will stand in the open border uninjured during ordinary winters, and so also would the herbaceous kinds were it not that they suffer from damp.

#### GARDENIA.

Most of this genus are hot-house plants; but the two species *G. florida* and *G. radicans* are best kept in a cool pit from the time that they go out of flower till it be desirable to make them form flower-buds for the succeeding season, when they should be shifted into fresh mould, plunged, or rather set, on the surface of a pretty strong bottom heat, a moist steam heat being kept up in the pit, and the lights kept rather closely shut. They will by this means show abundance of bloom buds, and beautiful fresh foliage, and when they are just about coming into bloom, if removed to the greenhouse or drawing-room, they will continue longer in flower, and perfume the whole apartment with their delightful fragrance. They are readily propagated by cuttings of the last year's wood, planted in rich, light mould, without glasses, in a humid, rather warm atmosphere.

#### ALONSOA, AND BOUVARDIA.

Both of these strike root freely by cuttings of the young wood placed in a slight heat, without covering; their whole culture is of the most simple kind; a soil half peat and half loam suits them very well.

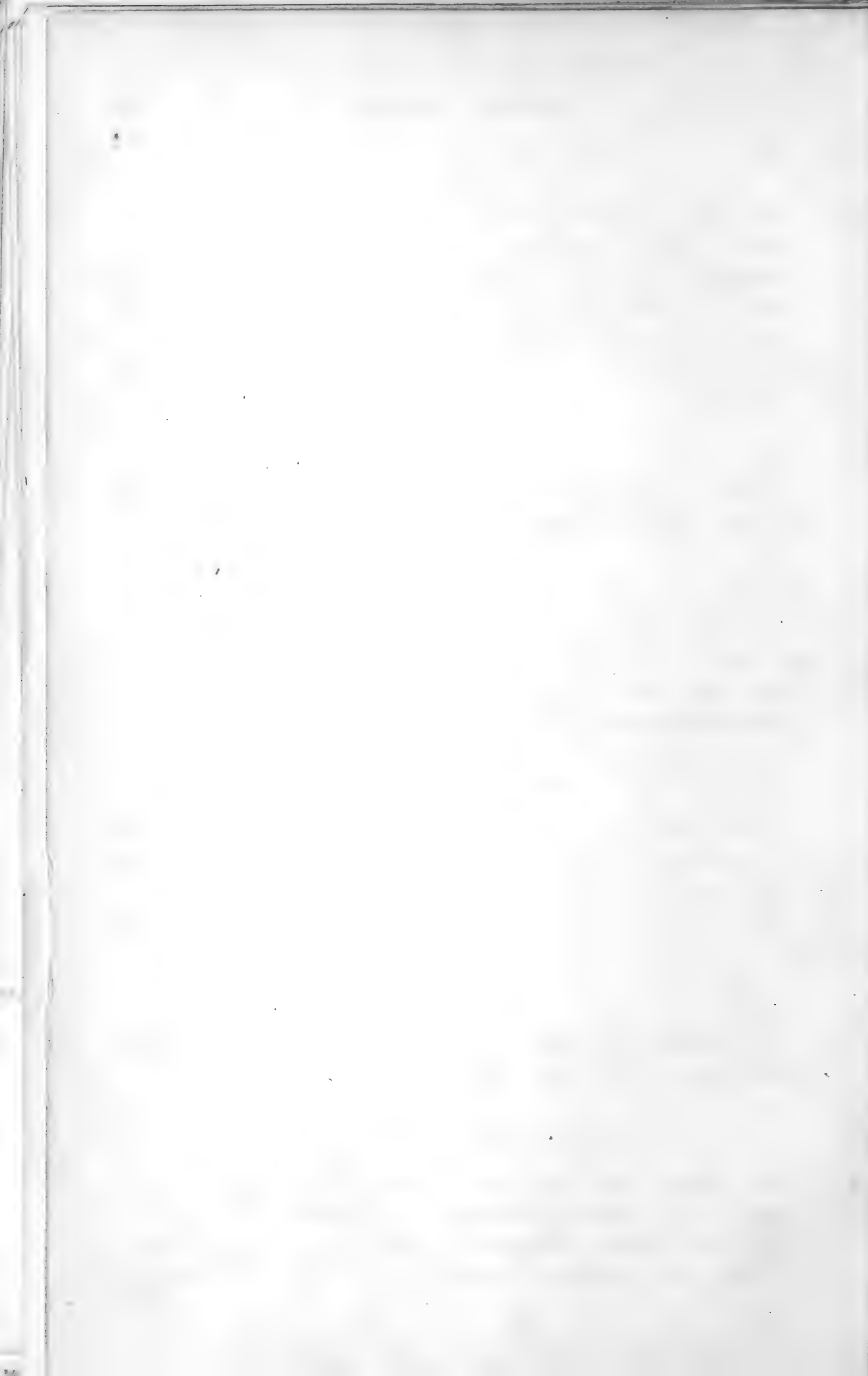
CALCEOLARIAS.



Flower

Leaves

Stem



## LOBELIA.

This genus has been recently divided into several genera: these are included under the original name, *Lobelia*. The small species, such as *L. erinoides*, &c., seed freely, and are increased by cuttings of the young shoots. The larger species, such as *L. tupa*, &c., multiply also by seeds, cuttings taken off close to the crown of the root, just as they are coming up in spring, and also the roots may be divided. They all prosper in a rich, light soil.

## FUCHSIA.

There is no genus that can be more readily increased; the young shoots root freely, and they will grow well in almost any kind of soil.

## CHRYSANTHEMUM.

The numerous varieties of the Chinese species of this family increase by cuttings, by dividing the root, and occasionally by seeds; but these seldom ripen in this country. The operation of propagation may be commenced almost at any season, and in any soil.

## PLUMBAGO, AND HIBISCUS.

These two genera are usually kept in the stove. *P. capensis* and *H. rosa-sinensis*, with its varieties, are much better in the greenhouse. They are propagated by cuttings of the half-ripened wood, planted in sand, and placed in a mild heat. A soil composed of good peat and light loam is the best for them.

## ANIGOZANTHOS.

This singular and handsome genus is increased by dividing the plant near its roots: it grows well in a peaty soil, or in peat and loam.

## CANARINA.

This genus is not by any means common, notwithstanding its great merits. It is increased by dividing the roots, and by exciting them in spring, and taking the young shoots off when about two inches long for cuttings. These are planted in sand, and root freely in a moderate heat

under a glass. A peat and loam soil is sufficient for it. The roots should be kept dry during winter, like the Dahlia, but kept in the pot.

#### ARCTOTIS AND GAZANIA

Are both increased by separation at the roots, and also by cuttings, which grow freely in a soil composed of peat and loam.

#### ERYTHRINA, CRISTA-GALLI, AND LAURIFOLIA,

Are plants of great beauty, lasting long in flower. The roots should be kept dormant during winter, and excited about the end of February, when young cuttings will be obtained from the numerous shoots that they will send up. These, taken off close to the root, and planted singly into small pots filled with sand and placed in a mild heat, will root freely, and if forwarded in the hot-bed or stove will flower the same season. But the best flowers will be obtained from the old plants, which can scarcely be put into too large a pot, and placed in the greenhouse. So hardy are both species that they will stand out of doors planted in the ground with a very slight protection. A rich soil should be given to them, as that will add much to their size, and to the beauty of the spikes of flowers.

#### BRUGMANSIA.

This genus is readily increased by cuttings taken off when quite young from near the root. If planted in any light, rich soil, they will grow rapidly. They require repeated shifting, because the larger the plant can be grown before flowering the better.

#### CLERODENDRON.

Of this genus the species *C. fragrans* is a beautiful and fragrant greenhouse plant, although generally kept in the stove. It is readily propagated by cuttings of the young wood, placed in a warm situation. A light, rich soil is requisite to have this plant in perfection.

#### HUMEA

Is increased by seeds sown early in spring, and treated like any pot-cultivated annual. It often flowers the first season, but always the next.



## PÆONIA.

The Chinese shrubby species are increased by layers, by cuttings, by grafting them on roots of one another. They are hardy enough to stand our winters in a sheltered spot, but as they flower so early in the season, their flowers are apt to be cut off by late frosts. When grown in pots they may be kept most of the year in a cold pit, and brought into the greenhouse to perfect their flowers, which are magnificent. Any rich, good soil suits them to grow in.

## CINERARIA.

Many of the species produce seeds, from which of late years some fine hybrids have been obtained. They all strike very readily by cuttings, and also by dividing at the root. No plants are more easily cultivated than these.

## ECHIUM.

The Cape species of this genus are splendid flowering plants, but too much neglected in modern cultivation. They ripen seeds, and are easily increased by cuttings, planted in sand, and placed in a cool situation. Peat and loam is a good soil for them.

## ANAGALLIS.

This pretty little genus is readily increased by cuttings, which strike in sand. The plants prefer light, sandy loam and peat.

## LECHENAULTIA.

The young tips of the shoots, taken off about an inch long, and planted in sand, covered with a bell-glass, and placed in a dry cool place, strike freely. The grown-up plants prefer peat and loam to grow in, but by far the greater portion of the former.

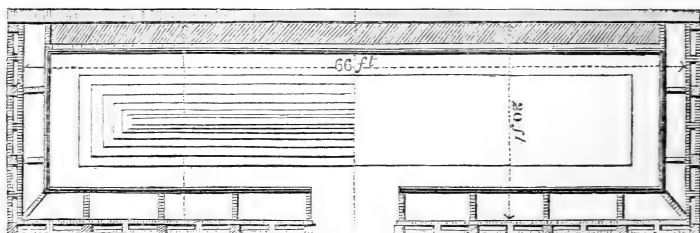
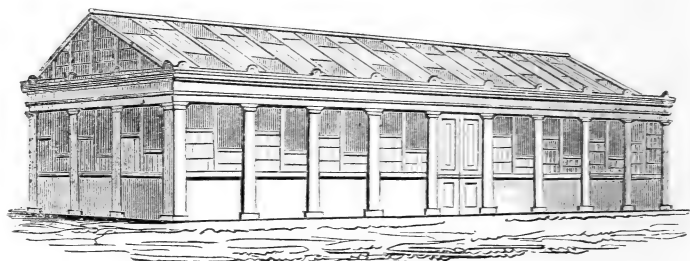
## PSORALEA.

A genus easily cultivated: the young or the half-ripened shoots root freely, and seeds are also frequently produced. They thrive well in a peat and loam soil.

## CORONILLA.

This genus is readily increased by cuttings of the young wood, planted in sand, left uncovered, and placed in a close heat. Peat and loam, of each equal parts, is a good soil for them.

In regard to the propagation of greenhouse climbers, &c., those enumerated at the beginning of this article strike by cuttings in the same way as directed for the plants above. They require a rich soil and considerable space for their roots to spread in, as the object is to make them grow luxuriantly, and flower abundantly.



*Ground Plan and Elevation of the Greenhouse of Mr. Perkins,  
at Chipstead, Kent.*

## SELECT LIST OF GREENHOUSE AND CONSERVATORY CLIMBERS.

### WHITE.

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|---|--|
| <p>Three-flowered Astephanus. (<i>Astephanus triflorus</i>.) Flowers in July and August, in peat and loam. Division. Four feet high.</p> <p>Spotted Celastrus. (<i>Celastrus punctatus</i>.) Flowers in May and July, in sandy loam. Cuttings. Six feet high.</p> <p>Twiggy Decumaria. (<i>Decumaria sarmentosa</i>.) Flowers in July and August, in peat and loam. Layers. Thirty feet high.</p> <p>Scollop-leaved Ipomæa. (<i>Ipomæa sinuata</i>.) Flowers in July and August, in common soil. Seeds. Six feet high.</p> <p>Common spring Caper Tree. (<i>Capparis spinosa</i>.) Flowers in May and August, in sandy loam. Cuttings. Three feet high.</p> <p>Masson's Virgin's Bower. (<i>Clematis Massoniana</i>.) Flowers in June and</p> | <p>September, in sandy peat. Layers. Twelve feet high.</p> <p>Chinese Virgin's Bower. (<i>Clematis chinensis</i>.) Flowers in April, in common loam. Layers. Twelve feet high.</p> <p>Herman's Bindweed. (<i>Convolvulus Hermannia</i>.) Flowers in August and September, in rich mould. Division of the root. Five feet high.</p> <p>Large-flowered Jasmine. (<i>Jasminum grandiflorum</i>.) Flowers in June and October, in rich mould. Cuttings. Fifteen feet high.</p> <p>Slender Jasmine. (<i>Jasminum gracile</i>.) Flowers all the year, in rich mould. Cuttings. Three feet high.</p> <p>Sweet-scented Jasmine. (<i>Jasminum odoratissima</i>.) Flowers most of the year, in rich mould. Cuttings. Three to six feet high.</p> |
|---|--|

### PURPLE.

- |  |   |
|--|---|
| <p>Glaucous-leaved Birthwort. (<i>Aristolochia glauca</i>.) Flowers in July, in peat and loam. Cuttings. Six feet high.</p> <p>Evergreen Birthwort. (<i>Aristolochia sempervirens</i>.) Flowers in May and June, in peat and loam. Division. Four feet high.</p> <p>Simple-leaved Kennedia. (<i>Kennedia monophylla</i>.) Flowers in March and June, in sandy peat. Cuttings. Ten feet high.</p> <p>Carolina Ipomæa. (<i>Ipomæa Carolina</i>.) Flowers in July and August, in rich mould. Seeds. Ten feet high.</p> <p>Great purple Ipomæa. (<i>Ipomæa purpurea</i>.) Flowers in June and Sep-</p> | <p>tember, in common loam. Seeds. Ten feet high.</p> <p>Woody Dolichos. (<i>Dolichos lignosus</i>.) Flowers in July and August, in peat and loam. Seeds. Twelve feet high.</p> <p>Canary Bindweed. (<i>Convolvulus canariensis</i>.) Flowers in May and September, in sandy loam. Division of the root. Twenty feet high.</p> <p>Climbing Cobæa. (<i>Cobæa scandens</i>.) Flowers in May and October, in peat and loam. Seeds. Twenty feet high.</p> <p>Climbing Lophospermum. (<i>Lophospermum rhodochiton</i>.) Flowers in June and July, in sandy loam. Cuttings. Fifteen feet high.</p> |
|--|---|

## PINK.

Common-blue-clustery Passion-flower. (*Passiflora cæruleo-racemosa*.) Flowers in June and October, in common loam. Cuttings. Thirty feet high.  
Flesh-coloured Passion-flower. (*Passiflora incarnata*.) Flowers in July

and August, in rich mould. Cuttings. Thirty feet high.  
Mealy-stalked Bindweed. (*Convolvulus farinosus*.) Flowers in May and June, in sandy loam. Division of the root. Six feet high.

## ORANGE.

Japanese Honeysuckle. (*Caprifolium japonicum*.) Flowers in July and September, in peat and loam. Cuttings. Fifteen feet high.  
Flexuose Honeysuckle. (*Caprifolium flexuosum*.) Flowers in July and September, in common loam. Cuttings. Ten feet high.  
Southern Tecoma. (*Tecoma australis*.)

Flowers in April and July, in sandy peat. Cuttings. Six feet high.  
Large-flowered Tecoma. (*Tecoma grandiflora*.) Flowers in July and August, in rich mould. Cuttings. Thirty feet high.  
Cape Tecoma. (*Tecoma capensis*.) Flowers in July and September, in peat and loam. Cuttings. Eight feet high.

## YELLOW.

Twining Hibbertia. (*Hibbertia volubilis*.) Flowers in May and October, in sandy peat. Cuttings. Eight feet high.  
Gooseberry-leaved Hibbertia. (*Hibbertia grossulariæfolia*.) Flowers in March and August, in sandy peat. Cuttings. Six feet high.  
Evergreen Gelsemium. (*Gelsemium sempervirens*.) Flowers in June and

July, in sandy peat. Cuttings. Six feet high.  
Revolute-flowered Jasmine. (*Jasminum revolutum*.) Flowers in June and October, in rich mould. Cuttings. Ten feet high.  
Large-leaved Trumpet-flower. (*Bignonia grandifolia*.) Flowers in April and July, in peat and loam. Cuttings. Sixty feet high.

## RED.

Broad-leaved Eustrephus. (*Eustrephus latifolius*.) Flowers in June and July, in sandy peat. Seeds. Three feet high.

Narrow-leaved Eustrephus. (*Eustrephus angustifolius*.) Flowers in July, in sandy peat. Cuttings. Three feet high.

## GREEN.

Climbing Asparagus. (*Asparagus scandens*.) Flowers in June, in sandy peat. Division of the root. Six feet high.

Flexuous Asparagus. (*Asparagus flexuosus*.) Flowers in July and Au-

gust, in sandy peat. Division of the root. Three feet high.

[The whole genera *Cissus* have green in conspicuous flowers; their foliage, however, is various and interesting, which, with their rapid growth, entitles them to greenhouse culture.]

## BLUE.

Spindle-shaped Apple-berry. (*Bilardiera fusiformis*.) Flowers in July and August, in sandy peat. Seeds. Eight feet high.

Cloth-leaved Bindweed. (*Convolvulus pannifolius*.) Flowers in June and

September, in sandy loam. Division of the root. Fifteen feet high.

Various-leaved Sollya. (*Sollya heterophylla*.) Flowers in June and October, in peat and loam. Cuttings. Eight feet high.

Blue Ipomæa. (*Ipomæa cœrulea*.)  
Flowers in June and September,  
in rich mould. Seeds. Nine feet  
high.

Compton's Kennedia. (*Kennedia  
Comptoniana*.) Flowers in January  
and March, in sandy peat. Cuttings.  
Twelve feet high.

Common blue Passion-flower. (*Passi-  
flora cœrulea*.) Flowers in June and  
October, in sandy peat. Cuttings.  
Thirty feet high.

Consequa's Wistaria. (*Wistaria Con-  
sequana*.) Flowers in June and Sep-  
tember, in sandy peat. Layers.  
Fifteen feet high.

## SCARLET.

Tendrilled Trumpet-flower. (*Bignonia  
capreolata*.) Flowers in July and  
August, in peat and loam. Cuttings.  
Twelve feet high.

Scarlet-flowered Kennedia. (*Ken-  
nedia coccinea*.) Flowers in March  
and April, in sandy peat. Cuttings.  
Ten feet high, and upwards.

## CRIMSON.

Climbing Apple-berry. (*Billardiera  
scandens*.) Flowers in June and Au-  
gust, in sandy peat. Cuttings.  
Twelve feet high.

Long - flowered Apple - berry. (*Billardiera longiflora*.) Flowers in June  
and September, in sandy peat. Cut-  
tings. Twelve feet high.

## ROSE.

Climbing Lophospermum. (*Lophospermum erubescens*.) Flowers in June and  
October, in rich loam. Cuttings. Twelve feet high.



## SELECT LIST OF GREENHOUSE PLANTS,

NOT INCLUDED IN ANY OF THE PRECEDING LISTS, AND CALCULATED  
FOR THE MIXED GREENHOUSE.

## WHITE.

From one to three feet high.

- Long-flowered Bouvardia. (*Bouvardia longiflora*.) Flowers in July and September, in loam and peat. Cuttings.
- Scented Lantana. (*Lantana odorata*.) Flowers in May and November, in peat and loam. Cuttings.
- Ever-blowing Wall-flower. (*Cheiranthus semperflorens*.) Flowers all the year, in sandy loam. Cuttings.
- Proliferous Cytisus. (*Cytisus proliferus*.) Flowers in April and May, in peat and loam. Seeds.
- Showy White-flowered Gloxinia. (*Gloxinia speciosa alba*.) Flowers in June and November, in sandy peat. Division of the root.
- White-flowered Chironia. (*Chironia albiflora*.) Flowers in June and September, in sandy peat. Cuttings.
- White Cineraria. (*Cineraria alba*.) Flowers in February and April, in common loam. Cuttings.
- Smooth Viper's Bugloss. (*Echium glabrum*.) Flowers in May and July, in sandy loam. Cuttings.
- Hispid Viper's Bugloss. (*Echium hispidum*.) Flowers in May and June, in peat and loam. Cuttings.
- White-flowered Rue. (*Ruta albiflora*.) Flowers in July and August, in rich mould. Cuttings.
- Rooting Gardenia. (*Gardenia radicans*.) Flowers in May and June, in rich mould. Cuttings.
- Fine-leaved Psoralea. (*Psoralea tenuifolia*.) Flowers in March and July, in peat and loam. Cuttings.
- West Indian Leadwort. (*Plumbago occidentalis*.) Flowers in April and September, in loam and peat. Cuttings.
- Flax-leaved Turnsole. (*Heliotropium linifolium*.) Flowers in June and September, in sandy peat. Cuttings.
- Morocco Turnsole. (*Heliotropium maroccanum*.) Flowers in June and July, in sandy loam. Cuttings.
- Ovate-leaved Struthiola. (*Struthiola ovata*.) Flowers in January and February, in sandy peat. Cuttings.
- Hoary Struthiola. (*Struthiola incana*.) Flowers in May and August, in sandy peat. Cuttings.
- Long-flowered Lobelia. (*Lobelia longiflora*.) Flowers in June and September, in sandy peat. Cuttings.
- Smooth Phylica. (*Phylica glabrata*.) Flowers in May and June, in peat and loam. Cuttings.
- Imbricated Phylica. (*Phylica imbricata*.) Flowers in August and September, in peat and loam. Cuttings.
- Dwarf Phylica. (*Phylica pumila*.) Flowers in May and June, in peat and loam. Cuttings.
- Feathered Phylica. (*Phylica pumosa*.) Flowers in March and May, in peat and loam. Cuttings.
- Milk-white Mallow. (*Malva lactea*.) Flowers in January and February, in common loam. Cuttings.
- Tooth-leaved Sage. (*Salvia dentata*.) Flowers in December and January, in sandy loam. Cuttings.
- White-flowered Sage. (*Salvia leucantha*.) Flowers in June and July, in sandy loam. Cuttings.

Squarrose Melaleuca. (*Melaleuca squarrosa*.) Flowers in June and July, in sandy loam, and peat. Cuttings.

Chaste Humble-plant. (*Mimosa pudica*.) Flowers in April and September, in rich mould. Seeds.

Flax-leaved Pimelea. (*Pimelea linifolia*.) Flowers in July and August, in sandy peat. Cuttings.

*Pimelea callina, glauca, ligustrina,*

*linoides, filamentosa, drupacea, spicata, incana.*

Spiked Sparrow-wort. (*Passerina spicata*.) Flowers in May and June, in sandy peat. Cuttings.

White-flowered Hebenstreitia. (*Hebenstreitia albiglora*.) Flowers in May and September, in loam and peat. Cuttings.

Ciliated Hebenstreitia. (*Hebenstreitia ciliata*.) Flowers in May and July, in peat and loam. Cuttings.

*From three to six feet high.*

Whitish-leaved Anthocercis. (*Anthocercis albicans*.) Flowers in April and July, in sandy peat. Cuttings.

Viscid Anthocercis. (*Anthocercis viscosa*.) Flowers in May and June, in sandy peat. Cuttings.

Dwarf Strawberry Tree. (*Arbutus pumila*.) Flowers in March and April, in peat and loam. Layers.

Canary Strawberry. (*Arbutus canariensis*.) Flowers in May and June, in sandy peat. Layers.

Frutescent Bæckia. (*Bæckia frutescens*.) Flowers in September and December, in sandy loam. Layers.

Flax-leaved Bæckia. (*Bæckia linifolia*.) Flowers in July and August, in sandy peat. Cuttings.

Cape Red Wood. (*Ceanothus capensis*.) Flowers in May and July, in loam and peat. Cuttings.

Milk-coloured Cineraria. (*Cineraria lactea*.) Flowers in June and July, in loam and peat. Cuttings.

Taller Cineraria. (*Cineraria elatior*.) Flowers in July and August, in peat and loam. Cuttings, and division of the root.

Chinese Spindle Tree. (*Euonymus chinensis*.) Flowers in May and June, in common loam. Cuttings.

Thunberg's Gardenia. (*Gardenia Thunbergia*.) Flowers in January and March, in loam and peat. Cuttings.

Fragrant Gardenia. (*Gardenia fragrans*.) Flowers in July and October, in loam and peat. Cuttings.

Broom Wall-flower. (*Cheiranthus scoparius*.) Flowers in May and October, in rich loam. Cuttings.

Cloud-born Cytisus. (*Cytisus nubi-genus*.) Flowers in May and June, in peat and loam. Cuttings.

Soft Viper's Bugloss. (*Echium molle*.) Flowers in June and July, in peat and loam. Cuttings.

Leafy Viper's Bugloss. (*Echium folio-*

*sum*.) Flowers in May and June, in peat and loam. Cuttings.

Solanum-like Thomasia. (*Thomasia solanacea*.) Flowers in April and July, in sand and peat. Cuttings.

Small-flowered Thomasia. (*Thomasia parviflora*.) Flowers in April and July, in loam and peat. Cuttings.

Hairy Psoralea. (*Psoralea hirta*.) Flowers in May and August, in peat and loam. Cuttings.

Strict Mallow. (*Malva stricta*.) Flowers in May and August, in common loam. Cuttings.

Oxycantha-like Mallow. (*Malva oxycanthoides*.) Flowers in May and August, in sandy loam. Cuttings.

Small-flowered Lasiopetalum. (*Lasiopetalum parviflorum*.) Flowers in April and July, in loam and peat. Cuttings.

Rusty Lasiopetalum. (*Lasiopetalum ferrugineum*.) Flowers in April and July, in loam and peat. Cuttings.

Oleander-leaved Protea. (*Protea nerifolia*.) Flowers in February and April, in sand, loam, and peat. Cuttings.

Magnificent Protea. (*Protea magnifica*.) Flowers in March and August, in sandy loam. Seeds and cuttings.

Great-flowered Protea. (*Protea grandiflora*.) Flowers in May and June, in sandy loam. Cuttings.

Sweet-scented Sage. (*Salvia odorata*.) Flowers in July, in sandy loam. Cuttings.

Whitest Sage. (*Salvia candidissima*.) Flowers in July and August, in sandy loam. Division of the root.

Bundle-flowered Metrosideros. (*Metrosideros floribundus*.) Flowers in July and August, in sandy loam. Cuttings.

Smith's Zieria. (*Zieria Smithii*.) Flowers in April and July, in sandy peat. Cuttings.

Pilose Zieria. (*Zieria pilosa*.) Flowers in May and July, in sandy peat. Cuttings.

Fragrant Clerodendrum. (*Clerodendrum fragrans*.) Flowers in August

and December, in sandy peat. Cuttings.

Livid Clerodendrum. (*Clerodendrum lividum*.) Flowers in November, in peat and loam. Cuttings.

#### YELLOW.

*From one to three feet high.*

Diffuse Acacia. (*Acacia diffusa*.) Flowers in May and June, in sand, loam, and peat. Cuttings.

Double-headed Acacia. (*Acacia stricta*.) Flowers in February and May, in sand, loam, and peat. Cuttings.

Four - angled Chironia. (*Chironia tetragona*.) Flowers in July and August, in sand and peat. Cuttings.

Berry - bearing Chironia. (*Chironia baccifera*.) Flowers in June and July, in sandy peat. Seeds.

Fine-leaved Wall-flower. (*Cheiranthus tenuifolius*.) Flowers in May and June, in loam and peat. Cuttings.

Silvery Crotalaria. (*Crotalaria argentea*.) Flowers in July, in sandy loam. Cuttings and seeds.

Flax - leaved Crotalaria. (*Crotalaria linifolia*.) Flowers in July and August, in common loam. Seeds.

Dwarf Crotalaria. (*Crotalaria pumila*.) Flowers in June and July, in sand and peat. Seeds.

Rough-leaved Burtonia. (*Burtonia scabra*.) Flowers in May and July, in sand, loam, and peat. Cuttings.

Sessile-leaved Burtonia. (*Burtonia sessilifolia*.) Flowers in March and July, in sand and peat. Cuttings.

Smaller Burtonia. (*Burtonia minor*.) Flowers in May and July, in sand and peat. Cuttings.

Willow-leaved Cineraria. (*Cineraria salicifolia*.) Flowers in June and August, in peat and loam. Cuttings.

Hoary Cineraria. (*Cineraria incana*.) Flowers in June and August, in loam and peat. Cuttings.

Early Cineraria. (*Cineraria præcox*.) Flowers in February and April, in peat and loam. Cuttings.

Fragrant Erinus. (*Erinus fragrans*.) Flowers in May and June, in sandy loam. Cuttings.

Lychnidea Erinus. (*Erinus lychnidea*.) Flowers in May and June, in sandy loam. Cuttings.

Prostrate Banksia. (*Banksia prostrata*.) Flowers in May and August, in loam and peat. Cuttings.

Creeping Banksia. (*Banksia repens*.) Flowers in May and August, in sand, loam, and peat. Cuttings.

Ciliated Borbonia. (*Borbonia ciliata*.) Flowers in July, in peat and loam. Seeds.

Ruscus-leaved Borbonia. (*Borbonia ruscifolia*.) Flowers in July and August, in peat and loam. Seeds.

Yellow Gnidia. (*Gnidia flava*.) Flowers in May and June, in sandy peat. Cuttings.

Pine-leaved Gnidia. (*Gnidia pinifolia*.) Flowers in May and June, in sandy peat. Cuttings.

Simple Gnidia. (*Gnidia simplex*.) Flowers in May and June, in sandy peat. Cuttings.

Capitate Gnidia. (*Gnidia capitata*.) Flowers in June and July, in sandy peat. Cuttings.

Silvery Gnidia. (*Gnidia argentea*.) Flowers in May and June, in sandy peat. Cuttings.

Nervose Dryandra. (*Dryandra nervosa*.) Flowers in March and May, in loam and peat. Cuttings.

Fine - leaved Dryandra. (*Dryandra tenuifolia*.) Flowers in March and May, in sandy peat. Cuttings.

Pteris-leaved Dryandra. (*Dryandra pteridifolia*.) Flowers in March and May, in peat and loam. Cuttings.

White-leaved Dryandra. (*Dryandra nivea*.) Flowers in July and September, in sandy loam. Seeds and cuttings.

Long - leaved Dryandra. (*Dryandra longifolia*.) Flowers all the year, in sandy peat. Seeds.

Tree Flax. (*Linum arboreum*.) Flowers in May and August, in peat and loam. Cuttings.

African Flax. (*Linum africanum*.) Flowers in June and July, in peat and loam. Cuttings.

Four-leaved Flax. (*Linum quadri-folium*.) Flowers in May and June, in peat and loam. Cuttings.

Fragrant Hermannia. (*Hermannia fragrans*.) Flowers in May and July, in loam and peat. Cuttings.

Velvety Hermannia. (*Hermannia velutina*.) Flowers in May and July, in loam and peat. Cuttings.

Soft-leaved Hermannia. (*Hermannia mollis*.) Flowers in May and June, in loam and peat. Cuttings.



- Glittering Hermannia. (*Hermannia micans.*) Flowers in May and August, in loam and peat. Cuttings.
- Hoary Melaleuca. (*Melaleuca incana.*) Flowers in June and August, in sand, loam, and peat. Cuttings.
- Chaste Mimosa. (*Mimosa casta.*) Flowers in July, in peat and loam. Seeds.
- Drooping - podded Ononis. (*Ononis cernua.*) Flowers in July and September, in common loam. Cuttings.
- Broom - like Jacksonia. (*Jacksonia scoparia.*) Flowers in June and August, in sand and peat. Cuttings.
- Spinous Jacksonia. (*Jacksonia spinosa.*) Flowers in April and September, in sandy peat. Cuttings.
- Golden-flowered Sage. (*Salvia aurea.*) Flowers in April and November, in peat and loam. Cuttings.
- Ledum - leaved Pomaderris. (*Pomaderris ledifolia.*) Flowers in April and June, in sandy peat. Cuttings.
- Philica - leaved Pomaderris. (*Pomaderris phyllicifolia.*) Flowers in April and June, in sandy peat. Cuttings.
- Woolly-leaved Struthiola. (*Struthiola tomentosa.*) Flowers in August and September, in sandy peat. Cuttings.
- Smooth Struthiola. (*Struthiola glabra.*) Flowers in May and August, in sand and peat. Cuttings.
- Tiled-leaved Struthiola. (*Struthiola imbricata.*) Flowers in April and August, in sandy peat. Cuttings.
- Yellow-flowered Bird's-foot Trefoil. (*Lotus luteus.*) Flowers all the year, in rich mould. Cuttings.
- Sessile - leaved Bird's-foot Trefoil. (*Lotus sessilifolius.*) Flowers in July and August, in sandy loam. Cuttings.
- Twiggy Sphærolobium. (*Sphærolobium vimineum.*) Flowers in May and August, in sandy peat. Cuttings.
- Horse - shoe Vetch. (*Hippocrepis balearica.*) Flowers in May and June, in rich mould. Cuttings.
- Balearic St. John's Wort. (*Hypericum balearicum.*) Flowers in March and September, in rich mould. Cuttings.
- Canary St. John's Wort. (*Hypericum canariense.*) Flowers in July and September, in peat and loam. Cuttings.
- Heart-leaved St. John's Wort. (*Hypericum cordifolium.*) Flowers in March and September, in common loam. Cuttings.
- Baxter's Mirbelia. (*Mirbelia Baxteri.*) Flowers in September and August, in sand, peat and loam. Layers.

*From three to six feet high.*

- Deceiving Acacia. (*Acacia decipiens.*) Flowers in March and June, in sandy loam and peat. Cuttings, but, like most of the family, much better by seeds.
- Diffuse Acacia. (*Acacia diffusa.*) Flowers in May and June, in sandy loam and peat. Cuttings and seeds.
- Yew-leaved Acacia. (*Acacia taxifolia.*) Flowers in April and June, in sandy loam and peat. Cuttings and seeds.
- Kindred Acacia. (*Acacia affinis.*) Flowers in April and June, in sandy loam and peat. Cuttings and seeds.
- Rue-leaved Acacia. (*Acacia rutæfolia.*) Flowers in April and June, in sandy loam and peat. Cuttings and seeds.
- Pendulous Acacia. (*Acacia pendula.*) Flowers in April and June, in sandy loam and peat. Cuttings and seeds.
- Dodonæa-leaved Acacia. (*Acacia dodonæifolia.*) Flowers in March and June, in sandy loam and peat. Cuttings and seeds.
- Cyclopis-like Acacia. (*Acacia Cyclopis.*) Flowers in April and June, in sandy loam and peat. Cuttings and seeds.
- Linear Acacia. (*Acacia linearis.*) Flowers in May and June, in sandy loam and peat. Cuttings and seeds.
- Yellowish - green - flowered Anigozanthos. (*Anigozanthos flavida.*) Flowers in May and September, in sand and peat. Division of the roots.
- Shore Anthocercis. (*Anthocercis littorea.*) Flowers in May and August, in sand and peat. Cuttings.
- Oak-leaved Banksia. (*Banksia quercifolia.*) Flowers in July and September, in sandy peat. Cuttings and seeds.
- Great - flowered Banksia. (*Banksia grandis.*) Flowers in May and August, in sandy peat. Cuttings and seeds.
- Nodding-flowered Banksia. (*Banksia nutans.*) Flowers in June and Sep-

- tember, in sandy peat. Cuttings and seeds.
- Wood Virgilia. (*Virgilia sylvatica*.) Flowers in August and October, in sandy peat. Cuttings and seeds.
- Many-flowered Dryandra. (*Dryandra floribunda*.) Flowers all the year, in sandy peat. Seeds.
- Feathered Dryandra. (*Dryandra plumosa*.) Flowers all the year, in loam and peat. Cuttings.
- Handsome Dryandra. (*Dryandra formosa*.) Flowers all the year, in peat and loam. Cuttings.
- Chinese Azalea. (*Azalea sinensis*.) Flowers in May, in sandy peat. Layers and cuttings.
- Valentian Coronilla. (*Coronilla valentina*.) Flowers in March and November, in rich mould. Cuttings and seeds.
- Silvery-leaved Coronilla. (*Coronilla argentea*.) Flowers in May and June, in rich mould. Cuttings and seeds.
- Twiggy Coronilla. (*Coronilla viminalis*.) Flowers in May and November, in loam and peat. Cuttings and seeds.
- Neat Crotalaria. (*Crotalaria pulchella*.) Flowers in July and August, in peat and loam. Cuttings.
- Wool-bearing Cytisus. (*Cytisus laniger*.) Flowers in June and July, in peat and loam. Seeds.
- Least Edwardsia. (*Edwardsia minima*.) Flowers in May and June, in sand and peat. Cuttings.
- Flowery Gardenia. (*Gardenia florida*.) Flowers in July and October, in loam and peat. Cuttings.
- Lotus-leaved Goodia. (*Goodia lotifolia*.) Flowers in April and July, in sandy peat. Seeds.
- Pubescent Goodia. (*Goodia pubescens*.) Flowers in April and July, in sandy peat. Seeds.
- Papillose Phylica. (*Phylica papillosa*.) Flowers in May and July, in peat and loam. Cuttings.
- Myrtle-leaved Phylica. (*Phylica myrtifolia*.) Flowers in May and June, in peat and loam. Cuttings.
- Anderson's Pittosporum. (*Pittosporum Andersonii*.) Flowers in May and June, in rich mould. Cuttings.
- Sprouty Jasmine. (*Jasminum fruticosum*.) Flowers in April and October, in rich mould. Cuttings.
- Low Jasmine. (*Jasminum humile*.) Flowers in June and September, in common mould. Layers.
- Many-spiked Mallow. (*Malva polystachya*.) Flowers in July and August, in common loam. Cuttings.
- Changeable Gaura. (*Gaura mutabilis*.) Flowers in July and August, in peat and loam. Seeds.
- Whitish Hermannia. (*Hermannia candidans*.) Flowers in April and June, in loam and peat. Cuttings.
- Many-flowered Hermannia. (*Hermannia multiflora*.) Flowers in March and May, in loam and peat. Cuttings.
- Anemone-leaved Isopogon. (*Isopogon anemonifolius*.) Flowers in July and August, in sandy peat. Seeds.
- Long-leaved Isopogon. (*Isopogon longifolius*.) Flowers in July and August, in peat and loam. Cuttings.
- Moorish Witsenia. (*Witsenia maura*.) Flowers in November and January, in sandy peat. Cuttings.
- Golden-flowered Sage. (*Salvia aurea*.) Flowers in April and November, in peat and loam. Cuttings.
- Lobed Cineraria. (*Cineraria lobata*.) Flowers in June and August, in peat and loam. Cuttings.
- Tree Wall-flower. (*Cheiranthus arboreus*.) Flowers in April and July, in sandy peat. Cuttings.
- Changeable Wall-flower. (*Cheiranthus mutabilis*.) Flowers in March and May, in loam and peat. Cuttings.
- Narrow-leaved Struthiola. (*Struthiola angustifolia*.) Flowers in May and August, in sandy peat. Cuttings.
- Bramble-stalked Mimosa. (*Mimosa rubicaulis*.) Flowers in June and July, in loam and peat. Seeds.
- Long-leaved Restharrow. (*Ononis longifolia*.) Flowers in July and August, in peat and loam. Cuttings.
- Tough Protea. (*Protea tenax*.) Flowers in February and May, in loam and peat. Cuttings.
- Nepal Bladder-Senna. (*Colutea nepalensis*.) Flowers in August and September, in common loam. Seeds.
- Chinese St. John's Wort. (*Hypericum chinense*.) Flowers in March and September, in peat and loam. Cuttings.
- Woolly Pomaderris. (*Pomaderris lanigera*.) Flowers in April and May, in sandy peat. Cuttings.
- Globulose Pomaderris. (*Pomaderris globulosa*.) Flowers in April and June, in peat and loam. Cuttings.
- Rough Metrosideros. (*Metrosideros asperus*.) Flowers in May and January, in sandy loam. Cuttings.
- Ribbed Metrosideros. (*Metrosideros costatus*.) Flowers in July and August, in sandy loam. Cuttings.

Flavescent Nerium. (*Nerium flaves-  
cens.*) Flowers in June and August,  
in rich mould. Cuttings.

Fan-formed-leaved Pentzia. (*Pentzia  
flabelliformis.*) Flowers in May and  
August, in peat and loam. Cut-  
tings.

Great-leaved St. John's Wort. (*Hy-  
pericum grandifolium.*) Flowers in

July and August, in sandy loam.  
Cuttings.

Bundle-flowered St. John's Wort. (*Hy-  
pericum floribundum.*) Flowers in  
August, in sandy loam. Cuttings.

Shining-leafy St. John's Wort. (*Hy-  
pericum foliosum.*) Flowers in Au-  
gust, in peat and loam. Cuttings.

## RED.

## From one to three feet high.

Various-coloured Bouvardia. (*Bou-  
vardia versicolor.*) Flowers in July  
and September, in sand, peat, and  
loam. Cuttings.

Poplar-leaved Cineraria. (*Cineraria  
populifolia.*) Flowers in June and  
September, in peat and loam. Cut-  
tings.

Headed Viper's Bugloss. (*Echium  
capitatum.*) Flowers in June and  
July, in peat and loam. Cuttings.

Galega-leaved Swainsonia. (*Swain-  
sonia galegifolia.*) Flowers in July  
and August, in sand and peat.  
Seeds.

Rigid Indigo. (*Indigofera rigida.*)  
Flowers in July and August, in  
sandy peat. Cuttings.

Capitate Mallow. (*Malva capitata.*)  
Flowers in November and December,  
in common loam. Seeds.

Rosy Pimelea. (*Pimelea rosea.*)  
Flowers in March and September, in  
sandy peat. Cuttings.

Cross-leaved Chironia. (*Chironia  
decussata.*) Flowers in June and  
September, in sandy peat. Cuttings.

Flax-like Chironia. (*Chironia linoi-*

*des.*) Flowers in July and Septem-  
ber, in sandy peat. Cuttings.

Smooth-leaved Stenochilus. (*Steno-  
chilus glaber.*) Flowers all the year,  
in sandy peat. Cuttings.

Shrubby Gaura. (*Gaura fruticosa.*)  
Flowers in August and October, in  
sandy loam. Cuttings.

Rosy Leadwort. (*Plumbago rosea.*)  
Flowers in March and July, in rich  
mould. Suckers.

Elegant Mallow. (*Malva elegans.*)  
Flowers in June and September, in  
common loam. Cuttings.

Twiggy Struthiola. (*Struthiola vir-  
gata.*) Flowers in April and August,  
in sandy peat. Cuttings.

Decussate Pimelea. (*Pimelea decus-  
sata.*) Flowers in May and June, in  
sandy peat. Cuttings.

Opposite-leaved Milkwort. (*Poly-  
gala oppositifolia.*) Flowers in May  
and August, in sandy peat. Cut-  
tings.

Long-peduncled Hibiscus. (*Hibiscus  
pedunculatus.*) Flowers in May and  
December, in sandy peat. Cuttings.

## From three to six feet high.

Lanceolate Ardisia. (*Ardisia lanceo-  
lata.*) Flowers in July and August,  
in peat and loam. Cuttings.

Sea-side Ardisia. (*Ardisia littoralis.*)  
Flowers in July and August, in peat  
and loam. Cuttings.

Phylic-like Grevillea. (*Grevillea  
phylicoides.*) Flowers in May and  
August, in sandy peat. Cuttings.

Trifurcate Grevillea. (*Grevillea tri-  
furcata.*) Flowers in April and Au-  
gust, in sandy peat. Cuttings.

Divaricate Indigo. (*Indigofera divari-  
cata.*) Flowers in July and August,  
in sandy peat. Cuttings.

Scattered-leaved Beaufortia. (*Beau-  
fortia sparsa.*) Flowers in May and  
July, in sandy peat. Cuttings.

Sage-leaved Lantana. (*Lantana sal-  
vieifolia.*) Flowers in April and No-  
vember, in peat and loam. Cut-  
tings.

Lavender-like Lantana. (*Lantana  
lavandulacea.*) Flowers in June and  
September, in peat and loam. Cut-  
tings.

Elegant Humea. (*Humea elegans.*)  
Flowers in June and October, in  
sandy peat. Seeds.

Large-calysed Mallow. (*Malva caly-*

*cina*.) Flowers in March and August, in common loam. Seeds.  
 Capitata Mallow. (*Malva capitata*.) Flowers in November and December, in common loam. Seeds.  
 Marsh Melaleuca. (*Melaleuca paludosa*.) Flowers in July and August, in sand, loam, and peat. Cuttings.  
 Handsome Protea. (*Protea formosa*.) Flowers in May and June, in peat and loam. Seeds.  
 Neat Protea. (*Protea pulchella*.) Flowers in March and August, in sand and loam. Layers.  
 Stipulated Muraltia. (*Muraltia stipulacea*.) Flowers in April and September, in sandy loam. Cuttings.  
 Pubescent Struthiola. (*Struthiola*

*pubescens*.) Flowers in April and August, in sandy loam. Cuttings.  
 Sweet-scented Nerium. (*Nerium odorum*.) Flowers in July and August, in rich mould. Layers.  
 Mediate Sphærolobium. (*Sphærolobium medium*.) Flowers in January and August, in sandy peat. Cuttings.  
 Scented Clerodendrum. (*Clerodendrum odoratum*.) Flowers in November and December, in sandy peat. Cuttings.  
 Cochinchinese St. John's Wort. (*Hypericum cochinchinense*.) Flowers in July and August, in common mould. Cuttings.

## SCARLET.

*From one to three feet high.*

Decussated Beaufortia. (*Beaufortia decussata*.) Flowers in May and July, in sandy peat. Cuttings.  
 Keel-leaved Beaufortia. (*Beaufortia carinata*.) Flowers in May and July, in sandy peat. Cuttings.  
 Three-leaved Bouvardia. (*Bouvardia triphylla*.) Flowers in April and November, in sandy peat. Cuttings.  
 Club-leaved Calothamnus. (*Calothamnus clavata*.) Flowers in July and September, in sandy peat. Cuttings.  
 Scarlet Gaura. (*Gaura coccinea*.) Flowers in August and October, in sandy loam. Seeds.

Mexican Sage. (*Salvia Mexicana*.) Flowers in May and July, in peat and loam. Cuttings.  
 Scarlet-flowered Sage. (*Salvia coccinea*.) Flowers in April and October, in peat and loam. Cuttings.  
 Pretty Sage. (*Salvia pulchella*.) Flowers in October and February, in sandy peat. Cuttings.  
 Resupinate Coral Tree. (*Erythrina resupinata*.) Flowers in January and September, in rich mould. Cuttings.  
 Handsome Lechenaultia. (*Lechenaultia formosa*.) Flowers in June, in peat and loam. Cuttings.

*From three to six feet high.*

Four-cleft Calothamnus. (*Calothamnus quadrifida*.) Flowers in July and September, in sandy peat. Cuttings.  
 Villous Calothamnus. (*Calothamnus villosa*.) Flowers in July and September, in sandy peat. Cuttings.  
 Slender-leaved Calothamnus. (*Calothamnus gracilis*.) Flowers in July and September, in sandy peat. Cuttings.  
 Scarlet Lantana. (*Lantana coccinea*.) Flowers in June and September, in peat and loam. Cuttings.  
 Caffrarian Coral Tree. (*Erythrina caffra*.) Flowers in August and October, in loam and peat. Seeds.

Fragrant Mallow. (*Malva fragrans*.) Flowers in May and July, in sandy peat. Cuttings.  
 Pine-leaved Stenanthera. (*Stenanthera pinifolia*.) Flowers in May and July, in sandy peat. Cuttings.  
 Splendid Melaleuca. (*Melaleuca fulgens*.) Flowers in July and September, in sand, loam, and peat. Cuttings.  
 Lily-flowered Hibiscus. (*Hibiscus liliiflorus*.) Flowers in June and July, in sandy peat. Cuttings.  
 Spotted Stenochilus. (*Stenochilus maculatus*.) Flowers in April and May, in sandy peat. Cuttings.  
 Long-leaved Stenochilus. (*Stenochilus*

*longifolius*. Flowers in April and July, in sandy peat. Cuttings.  
 Splendid Sage. (*Salvia splendens*.) Flowers in October and January, in common loam. Cuttings.  
 Scarlet Protea. (*Protea coccinea*.) Flowers in March and August, in sandy loam. Seeds.

Buffalo Burchellia. (*Burchellia bubalina*.) Flowers in May and June, in rich mould. Cuttings.  
 Cape Burchellia. (*Burchellia capensis*.) Flowers in March, in peat and loam. Cuttings.

## PURPLE.

*From one to three feet high.*

Jasmine-like Chironia. (*Chironia jasminoides*.) Flowers in April and July, in peat and loam. Cuttings.  
 Lychnis-like Chironia. (*Chironia lychnoides*.) Flowers in May and July, in sandy peat. Cuttings.  
 Neat Cineraria. (*Cineraria pulchella*.) Flowers in February and May, in sandy peat. Cuttings.  
 Bloody-leaved Cineraria. (*Cineraria cruenta*.) Flowers in February and May, in peat and loam. Cuttings.  
 Dark-flowered Erinus. (*Erinus tristis*.) Flowers in May and June, in sandy loam. Cuttings.  
 Splendid Protea. (*Protea speciosa*.) Flowers in March and June, in sandy loam. Seeds.  
 Dark-purple Bird's-foot Trefoil. (*Lotus atropurpureus*.) Flowers in April and December, in sandy loam. Cuttings.  
 Cape Virgilia. (*Virgilia capensis*.)

Flowers in July and August, in peat and loam. Cuttings.  
 Purple Lantana. (*Lantana purpurea*.) Flowers in June and September, in peat and loam. Cuttings.  
 Purpurascant Crotalaria. (*Crotalaria purpurascens*.) Flowers in July and August, in sandy loam. Seeds.  
 Small-petaled Cuphea. (*Cuphea micropetala*.) Flowers in July and August, in sandy loam. Cuttings.  
 Spotted-stalked Gloxinia. (*Gloxinia maculata*.) Flowers in July and October, in sandy peat. Cuttings.  
 Long-leaved Protea. (*Protea longifolia*.) Flowers in March and August, in sandy loam. Seeds.  
 Showy Mirbelia. (*Mirbelia speciosa*.) Flowers in May and July, in sand, loam, and peat. Cuttings.  
 Large-flowered Mirbelia. (*Mirbelia grandiflora*.) Flowers in May and June, in peat and loam. Cuttings.

*From three to six feet high.*

Proud Viper's Bugloss. (*Echium fastuosum*.) Flowers in April and August, in sandy loam. Cuttings.  
 Purple Thomasia. (*Thomasia purpurea*.) Flowers in April and July, in sandy peat. Cuttings.  
 Showy Milkwort. (*Polygala speciosa*.) Flowers in March and October, in sandy peat. Cuttings.  
 Fine-leaved Milkwort. (*Polygalatenuifolia*.) Flowers in April and June, in sandy peat. Cuttings.  
 Coronilla-leaved Swainsonia. (*Swain-*

*sonia coronillifolia*.) Flowers in July and August, in sandy peat. Cuttings and seeds.  
 Pleasing purple-coloured Indigo. (*Indigofera amena*.) Flowers in March and April, in sandy peat. Cuttings.  
 Mixed Muraltia. (*Muraltia mixta*.) Flowers all the year, in sandy peat. Cuttings.  
 Diffuse Muraltia. (*Muraltia diffusa*.) Flowers all the year, in sandy peat. Cuttings.

## PINK.

*From one to three feet high.*

Cape Aitonia. (*Aitonia capensis*.) Flowers in April and September, in rich mould. Cuttings.

Suffruticose Flax. (*Linum suffruticosa*.) Flowers in August, in peat and loam. Cuttings.

## PINK.

*From three to six feet high.*

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| <p>Thyrse-flowered Ardisia. (<i>Ardisia thyrsiflora</i>.) Flowers all the year, in peat and loam. Cuttings.</p> <p>Pleasing Gardenia. (<i>Gardenia amœna</i>.) Flowers in July and August, in loam and peat. Cuttings.</p> <p>Dilated-leaved Mirbelia. (<i>Mirbelia dilatata</i>.) Flowers in May and August, in sand, loam, and peat. Cuttings.</p> <p>Five-flowered Enkanthus. (<i>Enkanthus quinqueflora</i>.) Flowers in February and September, in loam and peat. Cuttings.</p> | <p>Netted Enkanthus. (<i>Enkanthus reticulata</i>.) Flowers in January and February, in peat and loam. Cuttings.</p> <p>Great-flowered Viper's Bugloss. (<i>Echium grandiflorum</i>.) Flowers in June and July, in sandy peat. Seeds.</p> <p>Shrubby Viper's Bugloss. (<i>Echium fruticosum</i>.) Flowers in May and June, in peat and loam. Cuttings.</p> <p>Maple-leaved Hibiscus. (<i>Hibiscus acerifolius</i>.) Flowers in March and June, in sandy loam. Cuttings.</p> |
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## ORANGE.

*From one to three feet high.*

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| <p>Silvery Hermannia. (<i>Hermannia argentea</i>.) Flowers in May and July, in loam and peat. Cuttings.</p> | <p>Baxter's Lechenaultia. (<i>Lechenaultia Baxteri</i>.) Flowers in April and July, in peat and loam. Cuttings.</p> |
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*From three to six feet high.*

- Flame-flowered Hermannia. (*Hermannia flammea*.) Flowers all the year, in loam and peat. Cuttings.

## BROWN.

*From one to three feet high.*

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| <p>Rufous Anigozanthus. (<i>Anigozanthus rufa</i>.) Flowers in May and September, in loam and peat. Division.</p> <p>Mangles's Anigozanthus. (<i>Anigozanthus Manglesii</i>.) Flowers in May</p> | <p>and June, in loam and peat. Division.</p> <p>St. James's Island Lotus. (<i>Lotus Jacobæus</i>.) Flowers all the year, in rich mould. Cuttings.</p> |
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## BLUE.

*From one to three feet high.*

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| <p>Smooth-stalked Viper's Bugloss. (<i>Echium levigatum</i>.) Flowers in July and August, in sandy loam. Cuttings.</p> <p>Involucrated Psoralea. (<i>Psoralea involucrata</i>.) Flowers in June and July, in peat and loam. Cuttings.</p> <p>Axillary-flowered Psoralea. (<i>Psoralea axillaris</i>.) Flowers in June and July, in sandy peat. Cuttings.</p> <p>Hairy Gloxinia. (<i>Gloxinia hirsuta</i>.)</p> | <p>Flowers in June and August, in sandy peat. Division of the roots.</p> <p>Cape Leadwort. (<i>Plumbago capensis</i>.) Flowers in November, in loam and peat. Cuttings.</p> <p>Filiform Roella. (<i>Roella filiformis</i>.) Flowers in June and September, in loam and peat. Seeds.</p> <p>Willow-leaved Angelonia. (<i>Angelonia salicariæfolia</i>.) Flowers in August, in common loam. Cuttings.</p> |
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## BLUE.

*From three to six feet high.*

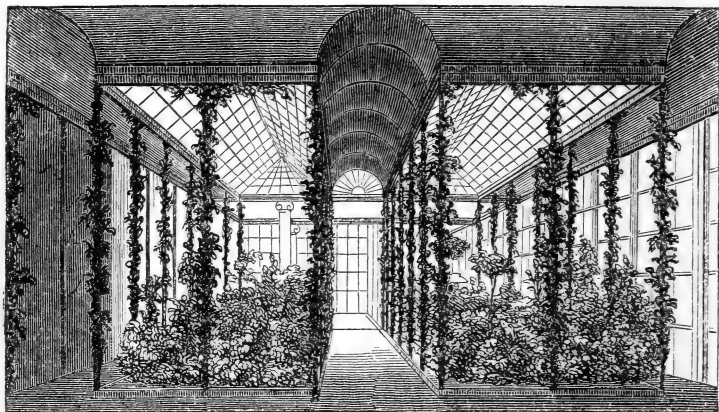
Violet-coloured Prostanthera. (*Prostanthera violacea*.) Flowers in May and August, in sandy peat. Cuttings.

Toothed Prostanthera. (*Prostanthera denticulata*.) Flowers in June and August, in sandy peat. Cuttings.

Silvery Viper's Bugloss. (*Echium argenteum*.) Flowers in July and August, in peat and loam. Seeds.

African Red Wood. (*Ceanothus africanus*.) Flowers in March and April, in peat and loam. Cuttings.





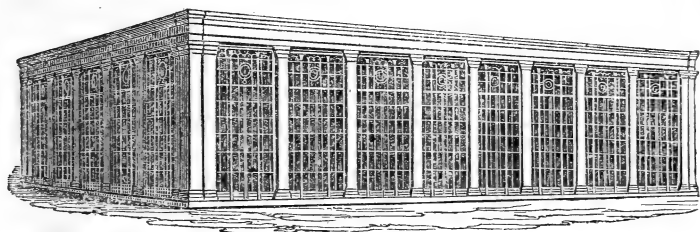
### THE CONSERVATORY.

THE Conservatory differs from the greenhouse only in the plants of the former being in general planted out into beds prepared for them, while those of the latter are always kept in pots and placed upon stages. The general intention of the former is also to contain large or fine specimens, while in the latter the plants are usually, and always ought to be, kept pretty small, and young by repeated propagation. The most proper situation for the conservatory is either in the flower-garden, where it should be a detached structure, or adjoining to the mansion, of which it may be said to form a part.

The principal object to be kept in view should be the admittance of abundance of air and light. For the former purpose all the sashes ought to be made moveable, so that the roof and sides may be taken away at pleasure, and for the latter the house, if not glass on all sides, at least the front and ends should be so. The most absurd and extravagant notions have been entertained of what a first-rate conservatory ought to be; structures have been projected covering several acres of ground, and of a capacity almost sufficient to admit of the tallest exotics attaining



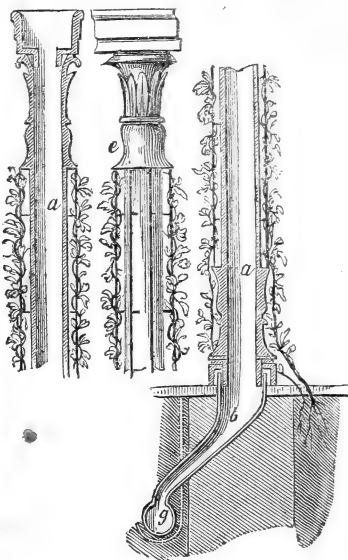
their native size. Building glass-houses so lofty, as we have already observed, we cannot approve of; for were expense no consideration, and were it possible to secure them against the effects of wind, which it is not, the plants when first planted would be so far from the glass that they would soon become drawn up, and, however lofty the house may be, they would endeavour to reach the top, while their lower parts would present only slender naked stems, presenting no beauty whatever. The idea of exhibiting exotic trees of their full size in this country is absurd, and can answer no useful end, even if practicable. If exotics are well cultivated in houses not exceeding twenty or twenty-five feet in height, all that is reasonably expected from them may be obtained.



*Elevation of the Conservatory at the Grange.*

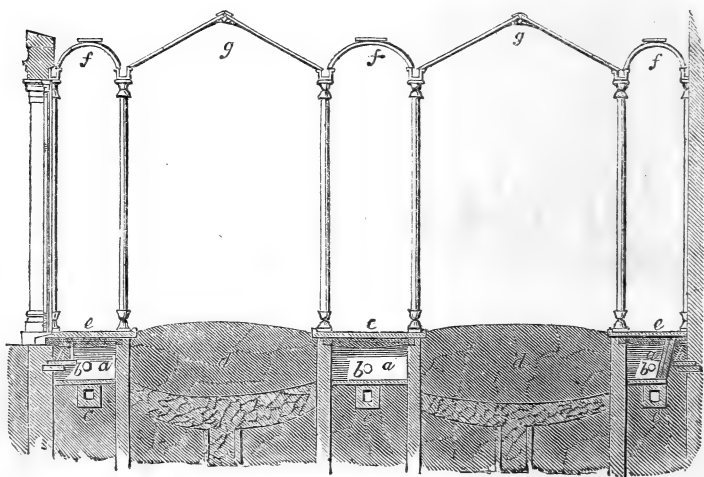
The dimensions of the Conservatory at the Grange, in Hampshire, one of the seats of Lord Ashburton, the interior of which is represented at the head of this section, and which was designed by C. R. Cockerell, Esq., is seventy feet in length, forty-six feet wide, and twenty-one feet high. The situation of this spacious area is adjoining the apartments dedicated to the ladies, the windows of whose apartments are directed towards the Conservatory. This house, in regard to architectural and horticultural proportions, two important points in similar structures, but seldom agreeing together, or with a due regard to the various bearings of situation and circumstances, is, in our opinion, the most complete thing of the kind that we have seen, either in this country or on the continent. We do not object to the extent of area covered with glass for conservatory purposes when the height does not exceed twenty-five feet, where the proprietor chooses to display his taste and spend his fortune in such rational luxuries, but it is when greater height is attempted that we object to them, as being both extravagant and useless. A glance at the

annexed diagram, which represents the section of the above splendid



house, will at once show how easy it would be, where expense is a secondary consideration, to cover any extent of ground, and to have an exotic garden in which perpetual spring could be maintained. The roof, which in this example is double, and which might be continued to any extent, is supported by cast-iron hollow columns, *a a*, which also carry off the water which falls on the roof, into drains properly placed for its reception, as at *g*, and which, after supplying an immense reservoir under the ground for the supply of the house, as well as for use in the event of fire, or any other scarcity of water, empties the remainder beyond the limits of the buildings. These

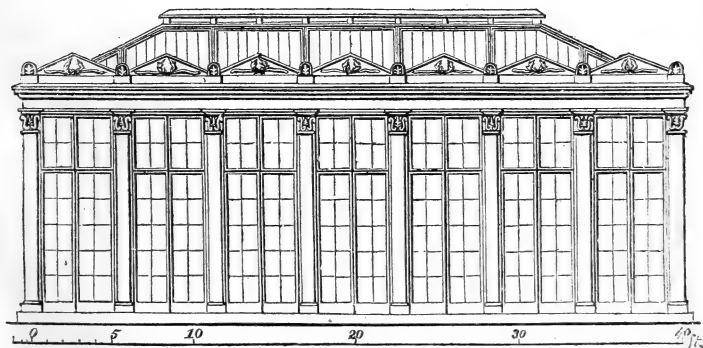
columns are highly ornamented with mouldings, and have wires fastened



to them, as at *e*, for the purpose of training creeping plants to them. The back and front walks, *e e*, are four feet nine inches broad, and the centre, or principal one, *c*, six feet and a half. These walks are covered with an arched roof, formed of double plates of rolled iron, *f f f*, between which is left a space of two inches, which confines a stratum of air, to prevent the escape of heat, or the admission of cold. Over these plates is placed an iron grating for a safe walk, to enable the operatives to repair the glass, give air, &c. This house was heated in a peculiar manner by Mr. Sylvester, either steam or hot water being applicable to that purpose; the pipes being placed under the walks, as at *b b b*, and the cavity *a a* served as a reservoir for containing heated air, which was admitted into the house as required.

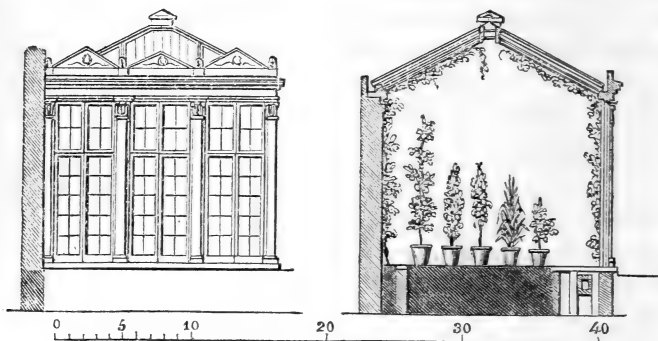
In regard to form and size, very much ought to be left to the taste of the owner; we would only here remark, that all curvilinear shapes, particularly roofs, are objectionable, on account of the great extra expense in their erection, and the difficulty of ventilating them thoroughly.

The annexed elevation, sections, and ground-plan represent what we consider to be another very good model of a Conservatory, upon a different principle; and as such a house really exists, and has been found to answer every purpose intended, we therefore offer it with the greater confidence.

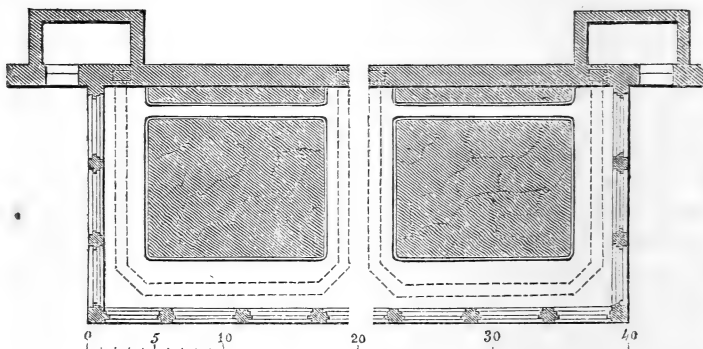


The length of this house is forty feet, eighteen feet wide, and eighteen high. The ground plan shows it as heated by two furnaces, one placed at each end of the back part; the flues, which are under the floor, pass towards the front, and parallel to it, until they meet in the middle of the house,

when they both cross towards the back wall, and the smoke of both escapes in one chimney, or a hot-water boiler being placed in the centre



of the back wall would answer equally well, the pipes extending both to the right hand and to the left, in the same situation as the flues are shown. The heat, whether from flues or hot-water pipes, is admitted into the house through ventilators placed in the floor, which can be



opened and shut at pleasure. The floor is paved with stone, and on it is set the plants, which should be large and well-grown specimens, planted

either in large vases, of which the annexed are examples, pots, boxes, or tubs; but these latter should be of the ornamental sort, and when small specimens grown in common flower pots are introduced, these may be set in vases, or in highly ornamental flower stands. It is the usual method of arranging conservatory plants, to plant them in beds of mould prepared for them, but by this means they soon grow too large, and the coarser, and often the most worthless, grow up rapidly and destroy the more rare and valuable, which frequently are of much more slender habits.

Conservatory plants planted in beds, not only grow too luxuriantly, and after two or three years require to be reduced in size by severe pruning, or removed altogether, but they do not flower so well as they would do in pots of a proper size, neither can they be removed in case of sickness, or at those periods when they are out of flower, or set in the open air during summer.

We admit that boxes, tubs, vases, &c., be they ever so ornamental, will be objectionable if in too great a number, or of too large a size. To remedy this objection, the floor may be hollow and covered with a neat ornamental iron grating, instead of pavement, made in convenient pieces, so as to admit of the larger boxes, tubs, &c., being placed under it, and having the smaller plants in vases, distributed through the house, so as to produce the most elegant and pleasing effect.

To those, however, who prefer to plant out their Conservatory plants in a permanent bed, the following observations may be useful.

The whole interior of the house should be excavated to the depth of four feet: below this depth, and in the centre of the bed or beds, a drain (vide cross section, page 234,) should be made, to permit the superfluous water to escape: over this drain, and also over the whole surface of the floor of the beds, a layer of broken stones, flints, brick-bats, or similar matter, should be laid to the depth of ten or twelve inches, upon which the mould for the plants to grow in should be placed. In proceeding to prepare the bed, it will be well to commence by placing a layer of turf, previously prepared, by being cut and dried so as to become sweetened, but not rotted so as to fall in pieces. The intention of this layer of turf is to prevent the finer particles of the compost soil from being washed down into the drainage below. This turf should be placed with the grassy side undermost, and closely jointed and beat down. Upon this the following compost soil should be laid, and which should have been in a state of preparation several months

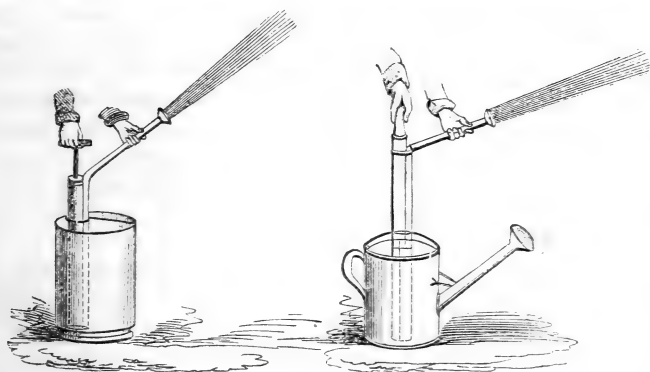
previous, by being frequently turned over, mixed, and sweetened,—light yellow loam and sandy peat in equal parts, excepting where camellias or oranges are intended to be planted. Should the loam rather incline to be strong, or the peat deficient of a proper portion of sand, then both deficiencies may be readily made up by the addition of a sufficient portion of fine, sharp river sand. The beds being filled with the above compost, regularly and moderately trodden down during the operation of filling, are then ready for the reception of the plants. We need hardly remind the most inexperienced that the mould should be as dry as possible at the time it is put into the beds, and also that a proper allowance of depth be allowed for settlement, which will be more or less, according to the manner in which it is trodden down during the operation. For a bed of the above depth an allowance of about six inches will in most cases be found sufficient, and indeed it is better always that the conservatory beds should appear rather high and full than low and under the floor level, a defect which cannot be readily rectified afterwards, as any attempt to raise it by the addition of more mould would bury the roots of the plants too deep, a circumstance greatly to be guarded against.

In Conservatories where oranges or camellias are intended to be planted out, a difference of soil is absolutely necessary, because for the former it can scarcely be too strong and rich if sufficiently porous to admit of extra humidity passing freely through it, and for the latter, a mellow, light, rather rich loam is to be preferred. Were either of these plants to occupy the whole bed of a conservatory, the required soil could be readily afforded them; but as they in general are only introduced as part of conservatory collections, it will be better to plant them in groups, either along the back of the bed, or at its ends, as circumstances and the good taste of the owner may suggest; in either case the soil should be adapted to them, which it could not be done so well if they were planted indiscriminately amongst the other plants.

In regard to the management of Conservatory plants, the whole may be included in a few words. Air cannot be too freely admitted to them even during winter, so that the temperature does not fall below forty degrees, nor should it be by any means allowed to exceed fifty degrees by artificial means. This may be said to be the great art of growing Conservatory plants well. In regard to water, where the trees are planted out, great caution must be paid that they neither become too dry at the roots, or soddened with an excess of it. When kept in large pots, vases, or

boxes, which is certainly the most eligible plan, there is much less danger in falling into either extreme, and the evil, should it even exist, is much easier rectified. Frequent watering by the application of the syringe is beneficial in a twofold light: it imitates both rain and wind, first by refreshing and cleansing the foliage and branches, and by the movement which the force of the water causes, strengthens and invigorates the shoots and stems. During summer, this species of watering should be applied twice or thrice a week, and during winter, in mild weather, once a week or fortnight. Much has been said upon the advantages of introducing perforated pipes through the roof for the purpose of supplying water to the leaves and branches; but, however beneficial or economical this plan may be when used in large houses in which tropical plants are grown, certain it is that the same beneficial effects would not be realised in any house in which plants of more temperate climates are cultivated. In respect to the majority of tropical plants, water can scarcely be given in too great abundance, because it is accompanied with a proportional degree of heat; but the case is wholly different with greenhouse and conservatory plants, which are more often injured by an excess than by a want of that element.

For the proper distribution of water over the leaves and branches of Conservatory plants, it will be necessary to be provided with a small port-



able water engine, and those of John Reads, 35, Regent's Circus, Piccadilly, may be recommended with confidence. The annexed figures represent

two small portable engines, that may be used by a lady with the greatest ease: they are placed in a pail, or common watering-pot of water, and discharge their stream from a powerful current to a gentle dew-fall. The same ingenious engineer has also invented another useful engine for similar purposes, which is fixed in a six-gallon tub, or vessel. By this engine, a column of water may be thrown to a distance of from forty or fifty feet. The valves of this latter machine being of solid metal, it can never get out of repair, at least for many years, if not wantonly or carelessly destroyed. Either of these we should say is indispensable in a Conservatory, and is neither of them expensive to purchase.

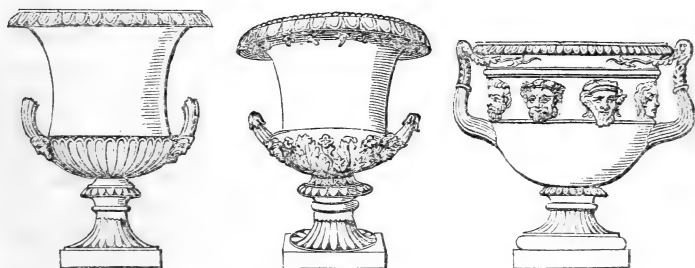
With the exception of climbing plants, we should prefer to see all others grown in boxes, tubs, vases, or pots, according to their various sizes, kinds, and habits.

Much judgment is required in the judicious selection of Conservatory plants, and it will be found that a much happier effect can be produced by a well chosen few than by a heterogeneous mixture of many species. If the intention be to have a profusion of bloom through as long a period of the year as possible, then fine, free-flowering kinds, not of very robust habits, should be chosen, and these which flower early in spring, through the summer, autumn, and even in winter, should be studied. Too many of one genus should not be introduced, as producing much less variety, neither should too many of any particular colour be admitted, for the very same reason. Great attention should be paid to procure, in the first instance, as perfect specimens as possible, and that these should be kept in that state by being allowed plenty of room, and frequently turned towards the points from which most light proceeds. Some discrimination is also necessary in their arrangement, so that all delicate and sun-loving plants be placed in front, while those that can dispense with solar influence for a longer period, or can accommodate themselves to its partial absence, should be placed in the rear, middle, or in those situations farthest from the light. An attention to cleanliness is absolutely necessary, even for the welfare of the plants, independently of the appearance of the house. All deceased, sickly, or deformed plants should be excluded from this kind of structure, and the very operations of watering, cleansing, and arranging should be carried on early in the morning, or late in the evening, so that during the day the whole may produce at all times a perfect whole, and be as fit for the inspection of the owner as his drawing-room or picture-gallery.



The Conservatory, being the highest in grade of all plant-structures, requires the greatest nicety and care in keeping; a dead leaf, insect, or broken or displaced branch should at no time appear. The propagation of Conservatory plants, so as to secure a succession, is a work of some importance, and will require to be performed at various seasons, as the cuttings should be put in just when the young shoots begin to assume a ripe, brownish colour, and are acquiring a firm texture. There are, however, many species of plants which cannot be propagated by cuttings, but which must either be increased by grafting, budding, layering, inarching, or by the more natural method of sowing the seeds. There are also many kinds which may be propagated by dividing the roots.

The plants which should be admitted into the Conservatory may be selected from those already enumerated in the foregoing pages, and from amongst them a very complete selection may be formed.



## SELECT LIST OF CONSERVATORY PLANTS.

\* \* \* Those marked (\*) are already enumerated in the Mixed Greenhouse, Heathery, &c.

## YELLOW.

- Wing-stalked Acacia. (*Acacia alata*.)  
Flowers in April and June, in sandy loam and peat. Cuttings, but much better by seeds.
- \*Deceiving Acacia. (*Acacia decipiens*.)  
Hatchet-shaped-leaved Acacia. (*Acacia dolabriformis*.) Flowers in April and July, in sandy loam and peat. Cuttings and seeds.
- Simple-leaved-armed Acacia. (*Acacia armata*.) Flowers in April and June, in sandy loam and peat. Cuttings and seeds.
- \*Pendulous Acacia. (*Acacia pendula*.)  
Juniper-leaved Acacia. (*Acacia juniperina*.) Flowers in March and June, in sandy loam and peat. Cuttings and seeds.
- Brown's Acacia. (*Acacia Brownii*.)  
Flowers in March and August, in sandy loam and peat. Cuttings and seeds.
- \*Prostrate Acacia. (*Acacia prostrata*.)  
\*Clammy-leaved Acacia. (*Acacia viscosa*.)  
Daviesia-leaved Acacia. (*Acacia Daviesiaefolia*.) Flowers in May and July, in sandy loam and peat. Cuttings and seeds.
- Reed-leaved Acacia. (*Acacia calami-folia*.) Flowers in May and June, in sandy loam and peat. Cuttings and seeds.
- Hooked-leaved Acacia. (*Acacia uncinata*.) Flowers in April and June, in sandy loam and peat. Cuttings and seeds.
- \*Yew-leaved Acacia. (*Acacia taxifolia*.)  
\*Cyclopis-like Acacia. (*Acacia Cyclopis*.)
- \*Kindred Acacia. (*Acacia affinis*.)  
Heavy-smelling Acacia. (*Acacia graveolens*.) Flowers in April and June, in sandy loam and peat. Seeds.
- Impressed Acacia. (*Acacia impressa*.)  
Flowers in April and June, in sandy loam and peat. Cuttings and seeds.
- Clothed Acacia. (*Acacia vestita*.)  
Flowers in April and July, in sandy loam and peat. Seeds.
- Sweet-scented Acacia. (*Acacia sweetii*.)  
Flowers in February and June, in sandy loam and peat. Cuttings and seeds.
- Whitened Acacia. (*Acacia dealbata*.)  
Flowers in March and June, in sandy loam and peat. Cuttings and seeds.
- Whorl-leaved Acacia. (*Acacia verticillata*.) Flowers in March and May, in sandy loam and peat. Cuttings and seeds.
- Sharp-cedar Acacia. (*Acacia oxycedrus*.) Flowers in April and June, in sandy loam and peat. Cuttings and seeds.
- Longest-leaved Acacia. (*Acacia longissima*.) Flowers in May and June, in sandy loam and peat. Cuttings and seeds.
- Bundle-flowered Acacia. (*Acacia florbunda*.) Flowers in May and June, in sandy loam and peat. Cuttings and seeds.
- Sophora-podded Acacia. (*Acacia sophoræ*.) Flowers in April and June, in sandy loam and peat. Cuttings and seeds.
- \*Rue-leaved Acacia. (*Acacia rute-folia*.)

- Pretty Acacia. (*Acacia pulchella*.) Flowers in April and July, in sandy loam and peat. Cuttings and seeds.
- Crest-flowered Acacia. (*Acacia lophantha*.) Flowers in May and July, in sandy loam and peat. Cuttings and seeds.
- Downy-stemmed Acacia. (*Acacia pubescens*.) Flowers in March and June, in sandy loam and peat. Cuttings and seeds.
- \*Yellowish-green-flowered Anigozanthos. (*Anigozanthos flavida*.)
- \*Shore Anthocercis. (*Anthocercis littorale*.)
- Chinese Azalea. (*Azalea chinensis*.) Flowers in May, in sandy peat. Layers.
- Neat-flowered Banksia. (*Banksia pulchella*.) Flowers in July and September, in loam and peat. Cuttings.
- Heath-leaved Banksia. (*Banksia ericifolia*.) Flowers all the year, in sandy peat. Cuttings.
- Spinulose Banksia. (*Banksia spinulosa*.) Flowers in May and December, in sandy peat. Cuttings.
- Hill Banksia. (*Banksia collina*.) Flowers in May and August, in sandy loam. Cuttings.
- Taller Banksia. (*Banksia elatior*.) Flowers in May and August, in loam and peat. Cuttings.
- Sea-side Banksia. (*Banksia littoralis*.) Flowers in August and September, in sandy peat. Cuttings.
- Marginate Banksia. (*Banksia marginata*.) Flowers in May and August, in sandy peat. Grafting.
- Entire-leaved Banksia. (*Banksia integrifolia*.) Flowers in July and October, in loam and peat. Cuttings.
- Well-matched Banksia. (*Banksia compar*.) Flowers in August and September, in peat and loam. Cuttings.
- Verticillate Banksia. (*Banksia verticillata*.) Flowers in July and October, in sandy peat. Cuttings.
- Mediate Banksia. (*Banksia media*.) Flowers in May and August, in loam and peat. Cuttings.
- Saw-leaved Banksia. (*Banksia serrata*.) Flowers in July and September, in sandy peat. Seeds.
- Dryandra-like Banksia. (*Banksia dryandroides*.) Flowers in July and September, in loam and peat. Cuttings.
- Showy Banksia. (*Banksia speciosa*.) Flowers in May and August, in loam, sand, and peat. Cuttings.
- Bearded Borbonia. (*Borbonia barbata*.) Flowers in July and August, in peat and loam. Seeds.
- Three-nerved Borbonia. (*Borbonia trinerva*.) Flowers in July and August, in peat and loam. Seeds.
- Lance-leaved Borbonia. (*Borbonia lanceolata*.) Flowers in July and August, in peat and loam. Cuttings.
- Wave-leaved Borbonia. (*Borbonia undulata*.) Flowers in July and August, in peat and loam. Cuttings.
- Heart-leaved Borbonia. (*Borbonia cordata*.) Flowers in July and September, in peat and loam. Seeds.
- Notch-leaved Borbonia. (*Borbonia crenata*.) Flowers in June and August, in loam and peat. Seeds.
- \*Sword Bossiæa. (*Bossiæa ensata*.)
- \*Round-leaved Bossiæa. (*Bossiæa rotundifolia*.)
- \*Small-leaved Bossiæa. (*Bossiæa microphylla*.)
- \*Leafy Bossiæa. (*Bossiæa foliosa*.)
- \*Box-leaved Bossiæa. (*Bossiæa buxifolia*.)
- Saw-leaved Callicoma. (*Callicoma serratifolia*.) Flowers in May and August, in sandy peat. Cuttings.
- Spear-leaved Callistachys. (*Callistachys lanceolata*.) Flowers in June and August, in sandy peat. Cuttings.
- Ovate-leaved Callistachys. (*Callistachys ovata*.) Flowers in June and August, in sandy peat. Cuttings.
- Wedge-leaved Callistachys. (*Callistachys cuneata*.) Flowers in June and August, in sandy loam. Cuttings.
- Toad-flax-leaved Callistachys. (*Callistachys linariæfolia*.) Flowers in June and August, in sandy peat. Cuttings.
- Wedge-shaped Candollea. (*Candollea cuneiformis*.) Flowers in August and September, in sandy peat. Cuttings.
- \*Rhomb-leaved Chorizema. (*Chorizema rhombea*.)
- \*Arborescent Crotalaria. (*Crotalaria arborescens*.)
- \*Genista-like Cyclopia. (*Cyclopia genistoides*.)
- \*Galium-like Cyclopia. (*Cyclopia galioides*.)
- \*Broad-leaved Cyclopia. (*Cyclopia latifolia*.)
- \*Racemulose Daviesia. (*Daviesia racemulosa*.)
- \*Small-umbelled Daviesia. (*Daviesia umbellulata*.)
- \*Thick-leaved Daviesia. (*Daviesia incrassata*.)
- \*Needle-leaved Daviesia. (*Daviesia acicularis*.)

- \*Furze-leaved *Daviesia*. (*Daviesia ulicina*.)
- \*Juniper-like *Daviesia*. (*Daviesia juniperina*.)
- \*Mimosa-like *Daviesia*. (*Daviesia mimosoides*.)
- \*Broad-leaved *Daviesia*. (*Daviesia latifolia*.)
- \*Squarrose *Daviesia*. (*Daviesia squarrosa*.)
- \*Cordate-leaved *Daviesia*. (*Daviesia cordata*.)
- \*Winged *Daviesia*. (*Daviesia alata*.)
- \*Rush-like *Daviesia*. (*Daviesia juncea*.)
- Bundle-flowered *Dillwynia*. (*Dillwynia floribunda*.) and all the genera.
- Many-flowered *Dryandra*. (*Dryandra floribunda*.) Flowers all the year, in sandy peat. Cuttings and seeds.
- Armed *Dryandra*. (*Dryandra armata*.) Flowers all the year, in loam and peat. Cuttings.
- Handsome *Dryandra*. (*Dryandra formosa*.) Flowers all the year, in loam and peat. Cuttings.
- Feathered *Dryandra*. (*Dryandra plumosa*.) Flowers in February and December, in loam and peat. Cuttings.
- Obtuse-leaved *Dryandra*. (*Dryandra obtusa*.) Flowers in July and September, in loam and peat. Cuttings.
- White-leaved *Dryandra*. (*Dryandra nivea*.) Flowers in July and September, in loam and peat. Cuttings.
- Long-leaved *Dryandra*. (*Dryandra longifolia*.) Flowers all the year, in sandy peat. Seeds.
- Baxter's *Dryandra*. (*Dryandra Baxteri*.) Flowers in March and May, in loam and peat. Cuttings.
- Fine-leaved *Dryandra*. (*Dryandra tenuifolia*.) Flowers in March and May, in sandy peat. Seeds.
- Nervose *Dryandra*. (*Dryandra nervosa*.) Flowers in July and September, in loam and peat. Cuttings.
- Obcordate-leaved *Euchilus*. (*Euchilus obcordatus*.) Flowers in March and June, in sandy loam and peat. Cuttings.
- \*Two-lobed *Gastrolobium*. (*Gastrolobium bilobum*.)
- \*Multiform *Gompholobium*. (*Gompholobium polymorphum*.) and all the rest of the genus.
- Lotus-leaved *Goodia*. (*Goodia lotifolia*.) and all the rest of the genus.
- Sulphur-coloured *Grevillea*. (*Grevillea sulphurea*.) Flowers in April and September, in loam and peat. Cuttings.
- \*Broom-like *Jacksonia*. (*Jacksonia scoparia*.)
- Rusty *Lasiopetalum*. (*Lasiopetalum ferrugineum*.) Flowers in April and July, in sandy peat. Cuttings.
- Rough *Metrosideros*. (*Metrosideros hispidus*.) Flowers in May and August, in sandy loam. Cuttings.
- Narrow-leaved *Metrosideros*. (*Metrosideros angustifolius*.) Flowers in May and June, in sandy loam. Cuttings.
- \*Arborescent *Oxylobium*. (*Oxylobium arborescens*.) and the rest of the genus.
- Fulvid *Pittosporum*. (*Pittosporum fulvida*.) Flowers in April and May, in rich mould. Cuttings.
- Woolly *Pittosporum*. (*Pittosporum tomentosum*.) Flowers in April and October, in rich mould. Cuttings.
- Rusty-leaved *Pittosporum*. (*Pittosporum ferrugineum*.) Flowers in February and May, in sandy peat. Cuttings.
- \*Three-lobed *Podolobium*. (*Podolobium trilobatum*.) and the rest of the genus.
- Stripped Rush-broom. (*Viminaria denudata*.) Flowers in June and September, in sandy peat. Cuttings and seeds.
- Twiggy *Sphærolobium*. (*Sphærolobium vimineum*.) Flowers in May and August, in sandy peat. Cuttings and seeds.
- Queen's *Strelitzia*. (*Strelitzia reginae*.) Flowers in April and May, in peat and loam. Suckers. All the genus, with the exception of *augusta*, will flower well in a good conservatory, although in general they are treated as stove plants.

## CRIMSON.

Showy *Callistemon*. (*Callistemon speciosus*.) Flowers in March and June, in sandy loam. Cuttings.

Spear-leaved *Callistemon*. (*Calliste-*

*mon lanceolatus*.) Flowers in June and November, in sandy loam. Cuttings.

Rigid Callistemon. (*Callistemon rigidus*.) Flowers in April and May, in sandy loam. Cuttings.  
 Ever-blowing Callistemon. (*Callistemon semperflorens*.) Flowers in

March and June, in sandy loam, Cuttings.  
 \*Proliferous Phœnocomma. (*Phœnocomma prolifera*.)

## BLUE.

Holly-leaved Plagiolobium. (*Plagiolobium ilicifolium*.) Flowers in March and July, in sandy peat. Cuttings.  
 Chorizema-leaved Plagiolobium. (*Plagiolobium chorizemifolium*.) Flowers

in March and July, in sandy peat. Cuttings.  
 Blue Ceanothos. (*Ceanothos azureus*.) Flowers in April, in peat and loam. Cuttings.

## FLESH-COLOURED.

Long-fruited Ardisia. (*Ardisia macrocarpa*.) Flowers in July and August, in sandy peat. Cuttings.

Lofty Knightia. (*Knightia excelsa*.) Flowers in May and August. Cuttings.

## PINK.

\*One-flowered Adenandra. (*Adenandra uniflora*.)  
 \*Pleasing Adenandra. (*Adenandra amœna*.)  
 \*Showy Adenandra. (*Adenandra speciosa*.)  
 \*Umbellate Adenandra. (*Adenandra umbellata*.)  
 \*Fragrant Adenandra. (*Adenandra fragrans*.)  
 Cape Aitonia. (*Aitonia capensis*.) Flowers in April and September, in rich mould. Cuttings.  
 \*Sprengelia-like Andersonia. (*Andersonia sprengelioides*.)  
 Box-leaved Andromeda. (*Andromeda buxifolia*.) Flowers in June and August, in sandy peat. Layers.  
 Silky Grevillea. (*Grevillea sericea*.) Flowers in April and September, in sandy peat. Seeds.  
 Strict Grevillea. (*Grevillea stricta*.) Flowers in April and September, in sandy peat. Cuttings.  
 Long-styled Grevillea. (*Grevillea stylosa*.) Flowers in April and September, in sandy loam. Cuttings.  
 Mucronulate Grevillea. (*Grevillea mucronulata*.) Flowers in April and

September, in loam and peat. Cuttings.  
 \*Serrulated Boronia. (*Boronia serrulata*.)  
 Small-wrinkly Callistemon. (*Callistemon rugulosus*.) Flowers in March and June, in peat and loam. Cuttings.  
 Five-flowered Enkianthus. (*Enkianthus quinqueflora*.) Flowers in February and September, in sandy loam and peat. Cuttings.  
 Netted Enkianthus. (*Enkianthus reticulata*.) Flowers in January and February, in peat and loam. Cuttings.  
 \*Box-leaved Eriostemon, (*Eriostemon buxifolius*), and all the rest of the genera.  
 Southern Indigofera. (*Indigofera australis*.) Flowers in March and June, in sandy peat. Cuttings and seeds.  
 \*Oxalis-leaved Loddigesia. (*Loddigesia oxalidifolia*.)  
 \*Five-petaled Lysinema, (*Lysinema pentapetalum*), and the rest of the genus.  
 Styrax-leaved Podalyria. (*Podalyria styracifolia*.) Flowers in May and July, in peat and loam. Cuttings.

## SCARLET.

Indian Azalea. (*Azalea indica*.) Flowers in March and May, in peat and loam. Cuttings.

Scarlet-flowered Banksia. (*Banksia coccinea*.) Flowers in May and August, in loam and peat. Cuttings.

\*Decussated Beaufortia. (*Beaufortia decussata*.)

Cape Burchellia. (*Burchellia capensis*.) Flowers in March, in peat and loam. Cuttings.

Linear Callistemon. (*Callistemon linearis*.) Flowers in June and July, in sandy loam. Cuttings.

\*Four-cleft Calothamnus. (*Calothamnus quadrifida*.)

\*Villous Calothamnus. (*Calothamnus villosa*.)

\*Club-leaved Calothamnus. (*Calothamnus clavata*.)

\*Slender-leaved Calothamnus. (*Calothamnus gracilis*.)

\*Henchman's Chorizema. (*Chorizema Henchmannii*.)

\*Showy Corraea. (*Corraea speciosa*.)

\*Pretty Corraea. (*Corraea pulchella*.)

\*Great-flowered Epacris. (*Epacris grandiflora*.) and all the rest of the genera.

Lily-flowered Hibiscus. (*Hibiscus liliflorus*.) Flowers in June and July, in sandy peat. Cuttings.

Splendid Melaleuca. (*Melaleuca fulgens*.) Flowers in July and September, in sandy loam and peat. Cuttings.

Most-splendid Warratah. (*Telopea speciosissima*.) Flowers in May and July, in sandy peat. Cuttings.

#### PURPLE.

Double-purple Indian Azalea. (*Azalea indica purpurea plena*.) Flowers in March and May, in peat and loam. Cuttings.

Purple Indian Azalea. (*Azalea indica phanicea*.) Flowers in May, in peat and loam. Cuttings.

\*Purple Crotalaria. (*Crotalaria purpurea*.)

\*Elegant Crotalaria. (*Crotalaria elegans*.)

\*Willow-leaved Crowea. (*Crowea saligna*.)

Acanthus-leaved Grevillea. (*Grevillea acanthifolia*.) Flowers in April and September, in loam and peat. Cuttings.

Neat Grevillea. (*Grevillea concinna*.) Flowers in April and September, in loam and peat. Cuttings.

Paterson's Hibiscus. (*Hibiscus Patersonii*.) Flowers in June and August, in sandy peat. Cuttings.

\*Purple Hovea. (*Hovea purpurea*.) and all the rest of the genus.

Neat Melaleuca. (*Melaleuca pulchella*.) Flowers in June and September, in sandy loam and peat. Cuttings.

Thyme-like-leaved Melaleuca. (*Melaleuca thymoides*.) Flowers in June and August, in sandy loam and peat. Cuttings.

Decussate Melaleuca. (*Melaleuca decussata*.) Flowers in July and September, in sandy loam and peat. Cuttings.

Dense-leaved Melaleuca. (*Melaleuca densa*.) Flowers in July and Au-

gust, in sandy loam and peat. Cuttings.

\*Pinnate-leaved Boronia. (*Boronia pinnata*.)

Heister's Muraltia. (*Muraltia Heisteria*.) Flowers in January, in sandy peat. Cuttings.

Squarrose Muraltia. (*Muraltia squarrosa*.) Flowers in May and July, in sandy peat. Cuttings.

Mixed Muraltia. (*Muraltia mixta*.) Flowers all the year, in sandy peat. Cuttings.

Hairy Podalyria. (*Podalyria hirsuta*.) Flowers in July and August, in peat and loam. Cuttings.

Silky Podalyria. (*Podalyria sericea*.) Flowers in January and October, in peat and loam. Cuttings.

Myrtle-leaved Podalyria. (*Podalyria myrtifolia*.) Flowers in April and July, in peat and loam. Cuttings.

Showy Milkwort. (*Polygala speciosa*.) Flowers from May to October, in peat and loam. Cuttings; as also the rest of the genus.

Cinnamon Rhododendron. (*Rhododendron cinnamomeum*.) Flowers in June, in light peat and loam. Layers, grafting, and cuttings.

Tree Rhododendron. (*Rhododendron arboreum*.) Flowers in May and June, in sandy peat. Layers and grafting. The same also may be said of the remainder of the tender species of this genus, without which no Conservatory can be said to be complete.

#### WHITE.

Bundled Andromeda. (*Andromeda fasciculata*.) Flowers in April and May, in sandy peat. Cuttings.

\*Whitish-leaved Anthocercis. (*Anthocercis albicans*.)

- \*Viscid Anthocercis. (*Anthocercis viscosa*.)
- Canary Arbutus. (*Arbutus canariensis*.) Flowers in May and June, in common garden soil. Layers.
- Laurel-leaved Arbutus. (*Arbutus laurifolia*.) Flowers in April and May, in sandy peat. Layers.
- Dwarf Arbutus. (*Arbutus pumila*.) Flowers in March and April, in sandy peat. Layers.
- Serrated-leaved Arbutus. (*Arbutus serratifolia*.) Flowers in February and March, in sandy peat. Layers.
- Crenulated Ardisia. (*Ardisia crenulata*.) Flowers all the year, in sandy loam. Cuttings.
- Pubescent Ardisia. (*Ardisia pubescens*.) Flowers in July and August, in peat and loam. Cuttings.
- Pure white Indian Azalea. (*Azalea indica alba*.) Flowers in March and May, in peat and loam. Cuttings.
- Two-spined Arduina. (*Arduina bispinosa*.) Flowers in March and August, in peat and loam. Cuttings.
- White-leaved Starwort. (*Aster argophyllus*.) Flowers in May and July, in sandy peat. Cuttings.
- Twiggy Bæckia. (*Bæckia virgata*.) Flowers in August and October, in sandy loam. Cuttings.
- \*Ledum-leaved Boronia. (*Boronia ledifolia*.)
- Sweet-scented Brugmansia. (*Brugmansia suaveolens*.) Flowers in August and September, in loam and peat. Cuttings.
- Tree Clethra. (*Clethra arborea*.) Flowers in August and November, in peat and loam. Cuttings.
- Variegated Tree Clethra. (*Clethra arborea variegata*.) Flowers in August, in peat and loam. Cuttings.
- \*White Corraëa. (*Corraëa alba*.)
- Cape Cunonia. (*Cunonia capensis*.) Flowers in August, in compost. Cuttings.
- Waved Drakæna. (*Drakæna undulata*.) Flowers in April and May, in peat and loam. Roots.
- Sweet-scented Drakæna. (*Drakæna*

- fragens*.) Flowers in February and May, in peat and loam. Roots.
- Cape Ekebergia. (*Ekebergia capensis*.) Flowers in July and August, in peat and loam. Cuttings.
- Blue-fruited Elæocarpus. (*Elæocarpus cyanus*.) Flowers in July and August, in peat and loam. Cuttings.
- Four-angled Eudesmia. (*Eudesmia tetragona*.) Flowers in July, in sandy peat. Cuttings.
- Myrtle-leaved Eugenia. (*Eugenia myrtifolia*.) Flowers in April and July, in sandy peat. Cuttings.
- Linear-leaved Grevillea. (*Grevillea linearis*.) Flowers in April and September, in sandy peat. Seeds.
- Subulate Lissanthe. (*Lissanthe subulata*.) Flowers in April and July, in sandy peat. Cuttings; and all the rest of the genus.
- Conspicuous Magnolia. (*Magnolia conspicua*.) Flowers in February and April, in peat and loam. Grafts.
- Bundle-flowered Metrosideros. (*Metrosideros floribundus*.) Flowers in July and August, in sandy loam. Cuttings.
- Exotic Murraya. (*Murraya exotica*.) Flowers in August and September, in light loam. Cuttings.
- Filiform Sparrow-wort. (*Passerina filiformis*.) Flowers in June and August, in sandy peat. Cuttings.
- Great-flowered Sparrow-wort. (*Passerina grandiflora*.) Flowers in May and June, in sandy peat. Cuttings.
- Wave-leaved Pittosporum. (*Pittosporum undulatum*.) Flowers in February and June, in sandy peat. Cuttings.
- Wedge-leaved Podalyria. (*Podalyria cuneifolia*.) Flowers in May and August, in peat and loam. Cuttings.
- Dampier's Westringia. (*Westringia Dampieri*.) Flowers in May and July, in sandy peat. Cuttings.
- Long-leaved Westringia. (*Westringia longifolia*.) Flowers in May and August, in sandy peat. Cuttings.
- Rigid Westringia. (*Westringia rigida*.) Flowers in May and August, in sandy peat. Cuttings.

## RED.

- \*Winged Boronia. (*Boronia alata*.)
- Twiggy Callistemon. (*Callistemon viminalis*.) Flowers in March and June, in sandy loam. Cuttings.
- Linear-leaved Callistemon. (*Callistemon linearifolius*.) Flowers in March and June, in peat and loam. Cuttings.

- Rosemary-leaved Grevillea. (*Grevillea rosmarinifolia*.) Flowers in April and September, in sandy peat. Cuttings.
- Acuminate Grevillea. (*Grevillea acuminata*.) Flowers in April and September, in sandy peat. Seeds.
- Pubescent Grevillea. (*Grevillea pu*

*bescens*.) Flowers in April and September, in sandy peat. Cuttings.  
 Long-peduncled Hibiscus. (*Hibiscus peduncularis*.) Flowers in May and December, in sandy loam. Cuttings.  
 Long-leaved Lambertia. (*Lambertia longifolia*.) Flowers in June and August, in sandy peat. Cuttings.  
 Handsome Lambertia. (*Lambertia*

*formosa*.) Flowers in June and August, in sandy peat. Cuttings.  
 Most-grateful Luculia. (*Luculia gratissima*.) Flowers in August and September, in peat and loam. Cuttings.  
 \*Retuse-leaved Templetonia, (*Templetonia retusa*), and the rest of the genus.

## BROWN.

Elks'-horn Acrostichum, (*Acrostichum alciorne*), an interesting fern. Flowers in August and October, in sandy peat. Division of the plant.  
 \*Rufous Anigozanthos. (*Anigozanthos rufa*.)  
 \*Mangles' Anigozanthos. (*Anigozanthos Manglesii*.)  
 Nodding Drakæna. (*Drakæna nutans*.) Flowers in July and August, in peat and loam. Cuttings.  
 Brown-stalked Magnolia. (*Magnolia*

*fusca*.) Flowers in April and May, in peat and loam. Layers, cuttings, and grafting on *M. purpurea* or *gracile*.  
 Anona-leaved Magnolia. (*Magnolia anonæfolia*.) Flowers in April and May, in peat and loam. Propagated as the last.  
 Southern Carmichaelia. (*Carmichaelia australis*.) Flowers in May and July, in sandy peat. Cuttings.  
 \*Rufous Corraea. (*Corraea rufa*.)

## ORANGE.

Orange-coloured Indian Azalea. (*Azalea indica aurantiaca*.) Flowers in March and May, in peat and loam. Cuttings.  
 \*Myrtle-leaved Eutaxia, (*Eutaxia myrtifolia*), and the rest of the genus.  
 Silaim-leaved Lomatia. (*Lomatia*

*silaifolia*.) Flowers in June and August, in sandy peat. Cuttings.  
 Globe-flowered Liparia. (*Liparia sphaerica*.) Flowers in July and August, in peat and loam. Cuttings.  
 Beautiful Platylobium, (*Platylobium formosum*), and the rest of the genus.

## STRIPED.

Variegated Indian Azalea. (*Azalea indica variegata*.) Flowers in March and May, in peat and loam. Cuttings.

## GREEN.

Green-flowered Corraea. (*Corraea virens*.)  
 Thyrse-flowered Cussonia. (*Cussonia thyrsoflora*.) Flowers in May and June, in loam and peat. Cuttings.  
 Spike-flowered Cussonia. (*Cussonia spicata*.) Flowers in June and July, in sandy loam. Cuttings.  
 Domestic Nandina. (*Nandina do-*

*mestica*.) Flowers in June and July, in peat and loam. Cuttings.  
 Green-flowered Callistemon. (*Callistemon viridiflorus*.) Flowers in June and August, in sandy loam. Cuttings.  
 Crest-flowered Callistemon. (*Callistemon lophanthus*.) Flowers in June and August, in sandy loam. Cuttings.

## YELLOW AND RED.

\*Holly-leaved Chorizema. (*Chorizema ilicifolia*.)

\*Dwarf Chorizema. (*Chorizema nana*.)

## CREAM-COLOURED.

Gigantic Doryanthus. (*Doryanthus excelsa*.) Flowers in July and August, in sandy peat. Cuttings.



## THE ORANGERY.

THE Orangery is a plant structure much more rare in Britain than in almost any other country in Europe. This has not always been the case; for the Orangery was amongst the first structures attempted in this country for the cultivation of exotic plants; and before the introduction of so many other exotics into England, which may be principally traced to our taking possession of the Cape of Good Hope, and the discovery of New Holland, the cultivation of the orange was common here. Our neighbours on the continent have for ages admired these trees, on account of the fragrance of their flowers, which they use in a variety of ways, and also on account of their being evergreens, which are much more rare in the gardens of the continent than they are with us. Indeed, so general is their cultivation in France, Germany, and the Netherlands, that the term *Orangerie* is synonymous with greenhouse in England, implying as though the culture of them were a primary consideration to that of exotic plants generally.

Under this head we include, of course, the lemon, citron, lime, and shaddock; and a house, either partially or completely filled with these trees when in flower or fruit, must be allowed to have a very imposing effect.

### STRUCTURES CALCULATED FOR THE GROWTH OF ORANGES.

The Orangery, according to our taste, should be either connected with the mansion, or at no great distance from it. If attached, it may, with greater propriety than can be admitted in other plant-house we have noticed, partake of the architectural style of the house, and hence may, in many cases, form a part of its elevation. The orange will thrive with a much less share of light and sun, particularly during winter, than almost any other exotic we know, but it appears during summer to like both in abundance. Houses, therefore, in which few other plants would live, may be advantageously used for the cultivation of the orange. The houses on the continent in which their most splendid collections are kept, such as those at Versailles, the Tuileries, at Lacken, Englien, &c., are all without

glass roofs, and such are also those in the royal gardens at Kew, Hampton Court, and Windsor Castle. A very good Orangery may be constructed, consisting of windows placed (the whole height of the front) between stone, wood, or brick columns or piers, with sufficient entablature and cornice to show its architectural character. The interior arrangements are exceedingly simple, there being required only a brick or well-rolled gravel floor for the tubs, boxes, or pots to stand on, and a flue or hot water pipe to extend round it under the floor level.

#### PROPAGATION AND GENERAL TREATMENT WHILE YOUNG.

Oranges and their allies, like all fruit-bearing trees, are propagated by seeds, but, for the most part, these are only used for stocks, on which to graft, inarch, or bud more approved kinds. The seeds should be sown in light, rich mould, placed in a gentle heat. When the young plants have attained the height of two feet or so, and about the thickness of a quill, they may then be grafted or inarched. The former process is usually and most successfully accomplished in a close, moist, warm frame or pit. The scion is put on upon the whip principle, secured by a strip of matting, and covered over with a small quantity of moss, kept a little damp. This is the best process when small and handsome plants are desired. Oranges have been successfully propagated by cuttings; and, perhaps, if due attention be paid to this mode of culture, handsome small trees may be obtained by it as soon as by any other. The following is the process followed by the late Henderson, of Woodhall, who was most successful as a cultivator of this tribe. "Take the strongest young shoots, and also a quantity of the two-year old shoots; these may be cut into lengths from nine to eighteen inches. Take the leaves off the lower part of each cutting, to the extent of about five inches, allowing the leaves that remain above that to remain untouched; then cut right across, under an eye, and make a small incision, in an angular direction, on the bottom of the cutting. When the cuttings are thus prepared, take a pot and fill it with sand, size the cuttings so that the short ones may be all together in one pot, and those that are taller in another; then, with a small dibble, plant them about five inches deep in the sand, and give them a good watering over head, to settle the sand about them. Let them stand a day or two in a shady place, and if a frame be ready with bottom heat, plunge the pots to the brim; shade them well with a double mat, which may remain till they have struck root; when rooted, take the sand and cuttings out of the pot, and plant them into single pots, in proper compost. Plunge the pots with the young plants again into a frame, and shade them for

four or five weeks, or till they have taken with the pots, when they may be gradually exposed to the light. From various experiments," Henderson remarks, "I have found that pieces of two-year old wood struck quite well; and in place, therefore, of putting in cuttings of six or eight inches long, I have taken off cuttings from ten inches to two feet long, and struck them with equal success."

This is a new, and, as it appears to us, the best method for obtaining handsome, small-flowering plants, such as could be conveniently brought into the drawing-room or flower-stand. However, when very large specimens are wanted, and the intention is to fill a separate house with them, we would recommend the purchase of trees already grown to some size, or the purchase of stocks of four or five feet in height, which can be bought at reasonable charges from the Italian warehouse keepers, who annually import plenty of such. These should be potted in large pots, in a very rich and strong loam, and placed in a mild humid temperature, when they may be budded in the Italian manner, or grafted or inarched like any other fruit-bearing tree.

A correspondent in the *Gard. Mag.*, Vol. I., p. 152, proposes, in the case of newly imported orange and lemon trees, to immerse them half way up their stems in water, at about sixty-four degrees, for twelve hours. They are then to be potted, and their stems enveloped in soft hay-bands, kept constantly moist, from the root to the bud. The shoots from the bud to be cut down to three eyes, and finally the pots plunged into a bed of nearly spent dung, made up in a vinery. The water used morning and evening was sixty-five degrees,—the same temperature as the air in the house. By following this method, the trees in ten days began to push vigorously, while others, that were not enveloped nor soaked in water, remained a month quite inactive.

Oranges, lemons, and shaddocks may be multiplied by cuttings in the following manner, and which is said to have been the invention of the late Mr. Hoy, long the superintendent of the gardens at Sion House:—The cuttings are selected from the young wood when it has attained a rather firm texture, and is cut across close below a joint, and then slit upward from the end to within a short distance from the next joint, at which joint it is tongued, as if it was to be laid. These slits are kept open by placing a small piece of stone or potsherd between the parts, as is often done in layering vines, carnations, &c. Cuttings so made, and planted in light, rich loam, and placed in a moderately warm and humid hot-bed or pit, and kept close by being covered with a hand or bell glass, will root speedily, and make excellent plants.

## GENERAL TREATMENT WHEN IN THE HOUSE.

Oranges have been very successfully cultivated by being planted out in prepared borders, either as standards, trained as espaliers, or against a wall. We, however, thinking that none of this family will ever be considered as worth cultivating in this country for the fruit they may produce, would prefer to grow them in pots or boxes, so that they would be portable, and capable of being used as objects of decoration, either in the house or during summer, when placed upon the lawn, &c.

The orange is not sufficiently hardy to stand in the open air of this country, generally, although there are instances of their existing in that state in the warmer parts of Devonshire, but they do not require artificial heat beyond what is merely sufficient to keep the temperature about a degree or two above the freezing point; indeed, when subjected to a few degrees of frost they do not appear to sustain any particular injury. During winter, therefore, if they be kept cool, supplied with abundance of air, and a limited supply of water, they will do very well. Henderson, whom we have already quoted, says, "The general management of orange trees, from the middle of March till the 1st of October, may be discussed in a few words. I give the trees a good watering all over the leaves once a-week, with the engine, excepting when they are in flower. Till the end of May, this watering is given about eleven o'clock in the forenoon; after the end of May, I give them a good dashing over the leaves twice a-week with the engine, and now, I do it in the evening. In very hot weather, I repeat the engine watering thrice a-week. I never set the orange trees out of doors in summer; for, from thirty-eight years' experience I find it is much against them. In the climate of Scotland, in hot weather, I keep them in the back of the vinery, under the shade of the vines, or behind the stage of the greenhouse. Orange trees delight to be in the shade in sunny weather; they here grow freely, and keep a fine dark-green colour. From October till March, I give them a gentle sprinkling over the leaves once in two or three weeks, but only in fresh [*mild*] weather, taking the opportunity of a mild day, when there is little sun, and always in the forenoon." Such is the practice laid down by this intelligent cultivator in the *Memoirs of the Caledonian Horticultural Society*, Vol. III. p. 303. This rule is applicable to the climate of Scotland, and differs from that practised by some excellent cultivators in England, and by all continental gardeners whatever, who make the placing of these trees, not only in the open air during a portion of summer, but placing them in the most exposed situation possible, where they

may enjoy the full force of the sun, a principal feature in their management. Our view of the case is founded on a pretty extensive knowledge of the treatment of these trees by the best continental cultivators, and also by observing that pursued by some of those in England also ; and we have come to the conclusion (although contrary to our own practice formerly), that these trees are benefited greatly by being placed out of doors during summer, that is, from the end of May till the middle of October.

#### GENERAL TREATMENT WHEN OUT OF DOORS.

When the orange trees are taken out as above, they should be placed upon a dry, hard gravel walk, or terrace, upon which the sun shines for the greater part of the day. While in this situation they should have an abundant supply of water once a day at least at their roots, and syringed over head once or twice a-week. Liquid manure should be applied occasionally, and the surface of the mould in the pots or boxes kept mulched or covered with short rich manure, the essence of which will be washed down to the roots at each watering. Any shoots that appear to be growing luxuriantly should be stopped when they have reached the length of six or eight inches, the object being to produce wood of about that length, which will be sufficiently ripened before autumn ; and this is the rationale of placing them in such a situation. If they be placed in a shaded place, the shoots would be drawn out long, slender, and immature, and would, in that case, be liable to damp off during winter, and at all events it would not be sufficiently perfected to form blossom buds, which is the principal object of their culture.

#### SOIL.

A strong loamy soil, enriched by manure, is the best for oranges, viz. one half rich, strong, clayey loam, and half well-rotted, rich manure, to which a small portion of ground bones may be added. The French gardeners, in preparing compost for their orange trees, endeavour to compensate for quantity by quality, because, as Bosc, in "*Nouveau Cours d'Agriculture*," justly observes, the pots or boxes in which the plants are placed ought always to be as small as possible, relatively to the size of the tree. At Genoa and Florence a strong yellow clay is preferred, as may be observed upon examining trees imported from those places. The Dutch, following this example, grow their trees in a strong, stiff clay, highly manured.

English writers on this subject have recommended a variety of mixtures,

but all agree in having a rich and rather strong soil, to which we may add, that our own practical opinion is, that a soil for these trees cannot well be too rich or too strong; even strong, rich brick earth, exposed to atmospheric changes for a year or two, and highly enriched with manure, we have found to answer our expectations.

#### POTTING AND SHIFTING.

Orange trees do not require to be re-potted or shifted so often as most other plants; once in two years or longer may be considered as a medium period for this operation. The months of March or April appear to be the best time, and the following the best mode of proceeding. When the plants are large, the boxes or tubs should be taken to pieces, in order that the roots may be examined without disturbing the ball. The best boxes for this purpose are those that are contrived so that they may be separated with as little trouble as possible, and those recommended in the *Gard. Mag.*, Vol. I., and in *M<sup>r</sup>Intosh's Practical Gardener*, Vol. II., are decidedly the best, as affording the greatest facilities, both for removing and examining the roots of the plants. Tubs have advantages also, and may be, like boxes, of any size above that of the largest size pots; they are readily taken to pieces by knocking off the hoops, and having a cooper at hand to put them together again. By either of these ways the operation of shifting becomes an easy matter, but when the boxes or tubs are not taken to pieces, then the tree and ball must be entirely lifted out of the tub and suspended by fixing a rope round the stem, and passing the other end over a pulley fixed to a triangle, that the tree may be so elevated that the new tub or box may be placed under it, into which the tree is lowered as soon as the necessary operations of examining the roots have taken place. There is one evil attending this plan, namely, the danger of injuring the bark by the rope. As the trees require a considerable quantity of water during summer, it is necessary that the tubs or boxes be well drained prior to the plants being placed in them, and that there be a sufficient number of holes perforated in the bottom, to admit of the escape of the superfluous water. Oranges should not be over-shifted, that is, they should not be put into tubs or boxes much larger than those out of which they were taken. If there be about an inch or an inch and a half of new mould added round the ball, it will, in most cases, be sufficient at one time. All decayed or broken roots should be carefully cut off, the sides of the ball loosened, and any hard or soddened lumps of mould removed, but in doing this, the greatest care must be taken that the young and healthy roots sustain no injury.

## THE PLANT VERANDAH.

FOR cottage or villa residences, no species of greenhouse, so far as convenience is concerned, has more advantages than a structure in the verandah fashion, that is, a covered projection, having a glazed front, and the roof wholly or in part of the same material. Such a structure may be placed against the front or one or more ends of the dwelling-house, the principal windows opening into it in the French manner, and the plants will require to be selected, and their arrangement made subordinate to the circumstances of the case.

Such a structure will answer the purpose of an agreeable lounge or promenade, which cannot fail to render them very desirable to the valetudinarian at all seasons, and to the young and active in times of rain and bad weather : it will also serve as a repository for exotic flowering plants ; and if some taste be displayed in the management and arrangement of them, they will produce a very pleasing effect. In the disposal of plants in such houses, we would direct particular attention to be paid to a judicious selection of choice free-flowering climbers, to be planted in spaces prepared for them under the floor, and to be trained up the front pilasters and under the rafters of the roof. The spaces for these plants need not be more than chambers, formed of about two feet by three, and eighteen inches deep, filled with good peat and loam, in which most plants of this description will grow freely. A space of a semi-circular form should be left in the pavement to receive the plant, and also to supply water to it ; this space need not be larger than about nine inches in length by six in its greatest breadth : and the opening should have a neat ornamental iron guard placed round it, about four inches in height, to prevent the stem of the plant from being injured or broken.

Presuming that the floor is paved, elegant stages or flower stands should be tastefully arranged, and rendered portable by being mounted upon casters ; but their arrangement and position may be altered, at the pleasure of the proprietor, so as to bring the plants into the light and shade, as their habits and other circumstances may require. On these stages or stands the smaller plants are to be placed.

Large and fine specimens should be placed in vases, which of themselves are ornaments for such a situation, if tastefully chosen, and of which the accompanying specimens may serve for examples. These vases are manufactured by Mr. Austin, of the New Road, London, at his artificial stone manufactory, and are both cheap and durable. Plants which are growing in large tubs, or boxes, and which would show to disadvantage if



standing upon the floor, may be set in cavities formed for them under it, such cavities being covered when not in use with the pavement, or what would be still better, with a neat metallic grating. This mode of concealing the tubs in which plants grow has been employed upon a large scale, and with the happiest effect, in some of the new houses lately erected in the Jardin des Plantes, at Paris, and upon a more limited scale, but with an equally good effect, in several greenhouses erected by Mr. Croskill, hot-house builder, &c., of Beverley, in Yorkshire.

These gratings answer another important purpose ; for, as the apparatus employed for heating should under all circumstances be placed as much as possible out of sight, and as it is necessary, on account of the natural property of heated air to ascend, that the flues or pipes be placed as low as possible, no place is so suitable for them as under the floor of such houses as that under consideration. We have seen plans in Mr. Croskill's possession, representing the whole floor of a large conservatory completely covered with an elegant ornamental grating, which in some cases is nearly as cheap as stone pavement, the whole made into convenient pieces, that can be taken up for the reception of plants, and laid down at pleasure. The only objection we have to metallic floors is, that they are great conductors of heat, and, therefore, would be disagreeable to walk upon in winter ; they are, however, less so when under a roof than if they were fully exposed to the air.



In structures of this kind a strict attention to the architectural style of the dwelling should be by no means disregarded. It would be incongruous and absurd to see a Doric, Corinthian, or Gothic building to which a verandah or greenhouse of any other order were appended, yet such instances of bad taste are often seen. Architectural decoration, however, must not be carried too far, particularly where it has the effect of excluding the light. There can, however, be no objection to the pilasters between the front sashes being so constructed as to show the style of architecture to which they belong. In regard to the dimensions of such houses, they should, under few circumstances, be of less length than that of the front of the house against which they are placed, and indeed of which they may be said to form a part: their height and width must always be governed by circumstances. If a sloping roof be adopted, it cannot be higher than the sill of the windows of the rooms immediately above it; the width then must be contracted to allow of sufficient fall for the water to run off, as the front or upright sashes should not be less than eight feet in height. To obviate this difficulty, and to increase the width, a curvilinear, or span roof, may be adopted, the centre or ridge of which may be, without objection, a foot or two above the level of the sill of the first-floor windows, because it will be sufficiently distant to prevent the view from being interrupted, or the rooms from being darkened.

Such structures are, however, better adapted for the display of flowering plants and fine specimens already grown to perfection, than for the more delicate process of rearing them from seeds, cuttings, &c. Such a house as we are now alluding to, should present at all times a perfect whole. The very changing of the plants when going out of flower, or the introduction of such as are coming into bloom, should be conducted early in the morning, or when the family is from home, or gone out, so that no appearance of disorder or confusion may be observed. Of course in this case we allude to families of distinction and fashion. The more humble, yet no less zealous amateur may take delight in conducting these arrangements personally, and derive as much pleasure from the contemplation of his own handywork as his more opulent and luxurious neighbour in viewing that which is prepared for him.

To maintain a regular supply for a house of this description when it is intended to be kept in the first degree of elegance and perfection, it will be necessary to have recourse elsewhere, and this can easily be accomplished, either by purchasing from the nurserymen, or by growing plants in a pit or greenhouse in the same garden. There are certain plants

that may be kept in the verandah at all periods, and indeed they form one of the principal features in this style of greenhouse, namely, *Camellias*, *Oranges*, *Pittisporums*, *Magnolias*, *Rhododendrons*, large and grotesque specimens of succulent plants, &c. ; and these, with a judicious selection of fine-flowering climbing plants, must always constitute the chief furniture of such a structure. The minor decorations may consist of *Geraniums*, *Heliotropeums*, *Fuchsias*, *Roses*, *Calceolarias*, the harder and free-flowering *Ericæ*, and other fine-flowering plants that are to be brought in, in succession, so as to keep the verandah at all time in a full-flowering state.

With the addition of a small brick pit of six or eight lights in length, having a flue in it to exclude frost, and divided in the middle, so that one end may be kept rather warmer than the other, all the plants above enumerated, and many more, may be grown in great perfection, so as to be brought in while in flower to decorate the verandah, and at little trouble or expense, and within the means of almost every person who occupies a house in the villa or cottage style.

It would be useless to attempt to give directions that would be generally applicable to all houses of this sort ; suffice it to say, that after having disposed of the large specimens of plants, so as to produce the most pleasing effect in the mind of the owner, the smaller ones may be tastefully arranged on pedestals, ornamental flower baskets, and in a variety of ways that would give effect to the whole. It should, however, be observed, that the nearer to the light and glass that all small-leaved plants are placed the better : the thicker and larger leaved plants, such as oranges, camellias, hydrangeas, &c., and most succulent plants, excepting the genus *Mesembryanthemum*, may be placed at a greater distance from the light.

In regard to heating the verandah, it should be by means of flues or hot-water pipes, placed under the level of the floor, the heat ascending from them into the house through ornamental metallic plates let into the pavement immediately over them, or, as the object is to repel frost only during the winter, an elegant German stove may be placed near one end, having its smoke-conducting pipes stretching out towards the other extremity. The whole expense of such a stove for a small house would not exceed five or ten pounds, and it may be used for many purposes when not in use in the verandah, which will in few seasons be longer than from the beginning of December to the middle or end of February.

Great caution ought to be observed to prevent such stoves from becoming too hot, and also that they be placed sufficiently distant

from the plants. A novel and economical method of heating such houses, and indeed most small greenhouses, would be to place on the top of a German stove a small boiler, placed in the centre of the house, and having the stove so constructed as to allow the smoke to escape under the floor, as is the usual manner in similar stoves used for heating halls, lobbies, &c. From this boiler a pipe should branch off from the right hand and another from the left, and be carried to any required distance, where they should make a turn, and again enter the boiler. Such an apparatus being portable, could be removed when not required, and used for a variety of domestic purposes, particularly in a laundry for drying linen, or a harness room for repelling damp, and a variety of other purposes that the ingenuity of the proprietor might suggest.

Verandahs, like greenhouses, conservatories, &c., may be conveniently heated, if placed over cellars, or other underground apartments, by having a regular hot-water boiler placed in them, with a conducting pipe rising from its top, (which of course must be a fixed one), which would conduct the hot water into a horizontal pipe, placed in a cavity under the floor, and extending to the end of the house, and either made to return under itself, or to make the circuit of the house, and again re-enter the boiler near its bottom. It is of no consequence how deep the cellar may be, or how high above it the house to be heated may be placed. However, that as little waste of caloric as possible may take place, we should recommend the perpendicular pipe to be covered with coarse canvass or sacking, or any other non-conducting substance.

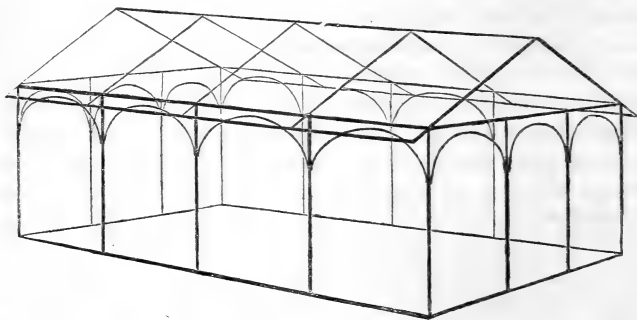
Neither is it essentially necessary that the boiler be placed directly under the verandah, &c., for if the pipes be covered as above, or enclosed in a wooden case and packed in saw-dust, they may be carried a considerable distance in a slanting, or even horizontal position, so long as they are kept above the level of the boiler.

Many dwelling houses are now heated by means of hot water, the boiler, &c. being placed in the cellar, or in a chamber constructed on purpose, a niche in the side of a passage, or any other more convenient place: when such is the case, a branch pipe may be readily conducted to the verandah, and the supply of hot water cut off or let on by means of Kewley's water-cock, as may be required.

Such we consider to be the perfection of the principle of heating plant structures of this description.

## THE PROTECTING TENT.

THE Protecting Tent is a plant structure which we regret to see so seldom used. The expense of glass-houses places them beyond the reach of many plant cultivators, but the Protecting Tent is of so economical and at the same time of so useful a character, that we cannot sufficiently recommend it to those who are partial to exotics, and at the same time have not the means of gratifying their taste. It is true that by this means we cannot preserve during winter so great a variety of plants as in the greenhouse or conservatory, neither can the Protecting Tent be considered so elegant and commodious a lounge; but by a judicious selection of plants, this may be made an interesting and useful structure. What we mean by the Protecting Tent is a portable frame-work erection of any desired dimension, of which the annexed diagram will give some idea,



formed of timber either dressed and painted, or of larch poles, with the bark taken off, to be erected over a selection of exotics, planted out in a prepared border, or erected over them grown in pots, vases, large tubs or boxes placed upon a prepared floor of well-rolled gravel or scoria, and covered during winter with canvass, patent tarred paper or felt, or any other cheap and flexible material. Such a protection would secure many plants

which are usually kept in the greenhouse, and are too tender to withstand our winters in the open borders. The whole erection should be put up about the beginning of October, and removed by the second week in June.

The Horticultural Society of London have to a certain extent carried this idea into execution, by the erection of a verandah, or pent covering, in front of a wall of great length. Against this wall has been planted all such plants as it was calculated would stand the winter in such a situation, and also some duplicate specimens, the hardiness of which it was desirable to determine. The utility of this plan is obvious to every one interested in plant culture, and it is in our opinion one of the very few really useful experiments made by a society commanding capital and opportunities which have never before fallen to the lot of any public or private horticultural body, either in this country or on the continent. A prepared border was formed at the bottom of this wall, rendered perfectly dry at the bottom, into which the plants are planted; they are nailed to the wall and trained in a way, however, which we are not singular in disapproving of. They should, in our opinion, have been allowed to grow in a more natural manner, excepting creeping plants, which of course require support. In this border many valuable bulbous-rooted plants were introduced, and these for some years succeeded admirably; but, as might have been expected, as the plants against the wall extended in growth, they would rob the bulbous-rooted kinds of their proper share of nourishment; and as a consequence they are, we believe, now nearly all dead. About three feet in front of this wall is ranged a row of larch poles about six feet apart, connected together at top by a slip of deal about six inches broad, upon which is laid hurdles thatched with straw, so as to form a roof between them and the wall, which not only keeps the plants dry, but the mould into which they grow,—a most important feature in the system of protecting exotic plants. These hurdles are placed over the plants in autumn, and removed in spring; the whole front being left open for the admission of sun and air, excepting in the case of any individuals more tender than the others, against which a mat is hung in the most severe weather, and which species of covering, as has been proved by Dr. Wells, in his Essay on Dew, is of much more utility in gardening than is generally known.

Had the Horticultural Society, instead of planting these exotics against a wall, planted them at some distance from it, or even in a sheltered part of the garden, and protected them in a similar manner, that collection of plants would at this day have assumed a very different aspect. We would recommend the Society to set about planting a selection of

exotics as soon as possible, extending over a surface equal to that covered by one of the splendid tents used at their exhibition fêtes, and which, if the plants were retained in pots plunged in the ground, would form an interesting feature, even during winter, in their garden, and serve as data to those who, not having the same means, would, nevertheless, be anxious to ascertain the comparative hardiness of exotic plants.

The Honourable and Reverend William Herbert, than whom few have shone more conspicuous in the study of plants, appears to have thought favourably of this mode of culture. "The vigour," he observes, "with which mules of the genus *Crinum*, and many other plants, grow out of doors against the front wall of a stove, persuades me that a great variety of plants might with a little care be cultivated better in the open ground than under glass, if the border in which they are to grow were properly prepared, and a tarpauling, or any water-proof covering, placed over them at the times when it might be requisite to exclude either rain or cold. The covering might hang on the two sides of a strong longitudinal pole, like the two slopes of a roof, and be made to roll up either with or without a spring. There are many plants which seem to enjoy a cool atmosphere, but will not flower nor thrive vigorously without the stimulus of heated earth at the root. Having chosen a situation where a furnace and boiler could be placed under ground," he "would carry the smoke-flue as far as its heat would extend on one side, and hot-water or steam pipes in a different direction, as might be found convenient, enclosed in a stone or brick flue, to as great an length as its influence might reach. In such a border he believes the genus *Hedychium*, and many others, would flower perfectly with the assistance of fire-heat in the summer, requiring nothing in winter but a covering to throw off the wet, and the heat might be turned into other pipes, for the advantage of plants which might require the warmth in winter rather than in summer. In front of a wall, a moveable verandah, which might be either ornamental or made of thatched hurdles, or hurdle-gates, would throw off the wet, which is the principal cause of injury in winter, for many shrubs will endure the access of severe frost to the head, if all wet can be effectually excluded from the base of the stem and from the root by any sloped heading. Under such a verandah, with occasional heat to the flue during the early summer, and perhaps in severe frost, *Amaryllis*, *Brunsvigia*, *Bulbine*, *Nerine*, *Hæmanthus*, and all the allied genera of African bulbs, as well as the South American, would certainly succeed better than by any other treatment. I believe," continues this authority, "that not only those, but even some of the tropical *Crinums* would succeed better so than in

a stove, and probably many shrubs which might not be expected to live there. The advantage of a verandah or pent covering, however rude, on the north side of a wall, for the protection of half-hardy plants, such as *Camellia japonica*, Asiatic species of *Rhododendrons*, &c., is not sufficiently known. It is the excitement occasioned by the access of the sun that makes such plants liable to injury, and a south aspect, whether in summer or winter, is prejudicial to them. I believe that the covering of a pent-roof in a northern aspect, without any flue, is more congenial to those plants than a greenhouse, with caution to prevent any heavy rain or snow from being driven upon them by a strong north wind, which is easily done by hanging mats along in such an emergency."

The management of plants in such a structure is not different from those in the regular conservatory, only, as the canvass or other covering does not admit of the free passage of light, it is necessary to admit that indispensable element by frequently opening it in different parts, particularly in autumn and spring: indeed, in most ordinary mild days during these seasons it may be nearly all thrown open by the simple process of having the canvass or paper mounted on rollers, and these wrought by pulleys, which will enable the proprietor to cover or uncover at pleasure. During winter partial opening must be only indulged in, but as light and air is so essentially necessary for all plants, it follows that the success of culture will depend upon the quantity of each admitted to the plants. During winter the border, if the plants be planted out, should be well covered with dry litter, or, what is better, both for resisting frost and also for appearance, is moss, different species of *Hypnum*, *Sphagnum*, &c., which should be laid over to the depth of six or nine inches. The stems of the plants should by November be enveloped by binding moss neatly round them as far up as to where the branches issue from them; the most luxuriant and imperfectly formed ones removed, which will admit of a greater circulation of air, and also lighten the trees of a number of shoots that would be almost certain to die through the winter. If the plants be grown in pots or tubs, it is of the utmost consequence that they be plunged in moss or similar medium to their full height, to prevent the action of frost from destroying the roots.

The situation for such a structure should be one that is sheltered from the effects of winds, and as favourably placed in respect to exposure to the sun as possible. That it be either naturally dry or rendered artificially so is of the greatest importance, and that the plants be kept as dry during winter as a due degree of safety will warrant. During summer this selection of plants will thrive well and flower abundantly. The first

and principal consideration to be attended to in attempting this branch of cultivation, is a selection of good flowering plants, sufficiently hardy to bear at least four or five degrees of frost. The following is a few, to which many others may be added, that will thrive nearly as well under this sort of protection as under that of an ill-constructed and badly managed greenhouse.

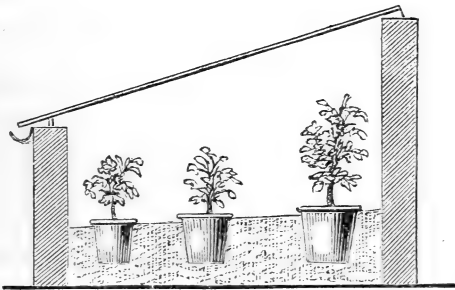
*Erica*, several species ; *Linum tigrinum*, *L. flavum*, *Phlomis Leonurus*, *Arbutus longifolia*, *Donia glutinosa*, *Leptospermum*, several species ; *Hypericum*, several species ; *Lavandula dentata*, *Polygala*, several species ; *Buddlea salviaefolia*, *Aster reflexus*, *A. argophyllus*, *Cistus*, many species ; *Magnolia annonæfolia*, *M. conspicua*, *M. fuscata*, *Salvia*, several species ; *Psoralea*, several species ; *Sutherlandia frutescens*, *Fuchsia*, all the species ; *Acacia*, several species ; *Illicium floridanum*, *I. anisatum*, *Cheiranthus*, several species ; *Teucrium*, several species ; *Convolvulus*, several species ; *Azalea indica*, *Daphne odora*, *Camellia*, many varieties ; *Myrsine africana*, *Cineraria*, several species ; *Myrtus communis et var.*, *Bauera rubioides*, *Pæonia Moutan*, *P. papaveracea*, *Indigofera*, several species ; *Lavatera*, several species ; *Edwardsia*, several species ; *Genista*, several species ; *Correa alba*, *Malva*, several species ; *Pittosporum*, most of the genus ; *Mesembryanthemum*, many species ; *Lonicera*, several species ; *Hibbertia*, several species ; *Ononis*, several species ; *Agapanthus*, all the genus ; *Verbena*, several species ; *Geranium* and *Erodium*, many Cape species ; *Anthyllis*, several species ; *Medicago arborea*, the Nepal *Rhododendrons* and tender English hybrids, and many others. (See *Select List of Cold Pit Plants*.)

In situations naturally warm and sheltered a whole shrubbery might be thus formed, and covered at no great expense. It must be, however, remarked, that it is only in favourable situations where this species of culture can be supposed to succeed ; in those that are unfavourable it would be folly to attempt it upon any scale. Plants so treated will be found to succeed much better than those planted against a wall, which, although often practised, has been experimentally proved to be not the most eligible situation in which to plant exotics with a view to their being kept out of doors during winter.



## THE COLD PIT.

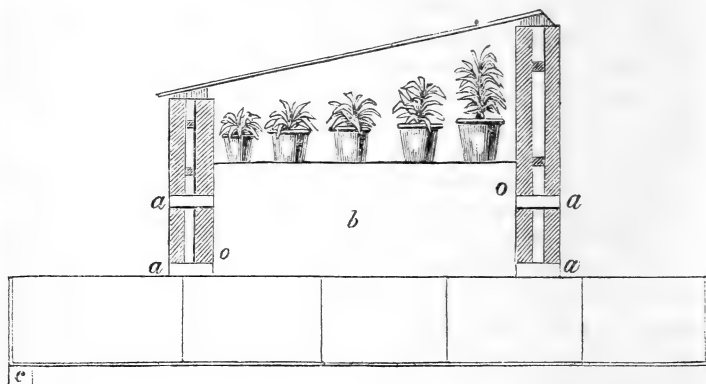
THE Cold Pit is one of the most useful of all plant structures. A pit of considerable length may be erected at little expense, and the number of plants that may be kept in it during winter is almost unknown, and the trouble attending them very little. This is also a plant structure that almost every person who has a garden, ever so small, may indulge in. The Cold Pit, as will be seen by referring to the annexed sketch, differs not from pits in ordinary use. As the principal object in view is to keep out frost, we would advise that the pit be formed of nine-inch brick-work, both back and front; and where the ground is sufficiently dry, that it be as much under the surface as possible, but on no account sink it if danger from damp be apprehended. The bottom, under all circumstances, should



be upon a foundation of broken stones, brickbats, or coarse gravel, to admit of the free escape of superfluous moisture. The floor on which the pots are to stand should be formed of coal ashes, which is the driest material that can conveniently be obtained. The lights should be well glazed, the squares small, and the laps puttied. The best covering to place over the

roof is the patent tarred paper or felt, Dutch reed mats, or straw mats, all of which not only resist the cold, but carry off the water that falls on them. During the most intense frost a covering of fine meadow hay, dried fern, or wheat straw, may be laid upon the glass, and over that either of the above coverings that may be most conveniently procured. Common bass mats may be used, but they are inferior to either of the above, both in durability, economy, and in the capability of throwing off the water.

The annexed pit is an improvement on the Cold Pit in general use, and consists of walls built hollow, which are well known to resist cold better than solid walls of the same thickness. The plants are set on a boarded floor, with sufficient apertures to admit of the superfluous water passing through



and falling into the empty space under them. A circulation of air is kept up by opening the ventilators *a a*, which, passing through the empty space *b*, and up through the flooring and amongst the plants, is beneficial to them, and prevents damp from accumulating in the bottom of the pit. Such a pit as this, one hundred feet in length and six or seven feet wide, would contain a fine collection of plants, and might be divided into four or five compartments by party walls, or by moveable wooden partitions, as in the ground plan, and an arrangement followed somewhat similar to that recommended in the foregoing pages. To render such a pit complete, a two or three inch pipe might be made to circulate round it under the platform, to be heated by hot water from a small boiler placed at the

middle or at either of the ends, as at *c*. Such an arrangement would be very complete, and is undoubtedly the most economical structure that can be erected for the cultivation of greenhouse exotics.

With such materials as these, most of the plants usually found in our greenhouses may be safely kept during the winter, and indeed many of them much better. The management of such pits is of the simplest kind possible, and may be stated briefly as follows:—Admit as much air as possible at all times by removing the lights entirely during the day when the weather is dry and mild, and by propping them up both in front and at the back when it is cold or rainy. Allow the plants sufficient room to grow, that is, place them so that they do not touch each other. Remove decayed leaves as they appear, and all other matters likely to generate damp or rottenness. Give no more water during winter than enough to keep the plants in good health, and spill as little of it as possible in the pit during the period when it is much shut up. Cover carefully in time of frost early in the afternoon, and uncover as early in the morning as can be done prudently. Frequently examine the plants, and change their position two or three times between November and March. Keep the pots plunged in scoria or ashes, or similar non-conductors, to prevent the roots of the plants from being frozen.

Such pits, and even ones of less solidity, as well as common garden frames, are much used by the best commercial cultivators, who find great advantage from their use; we only wonder that they are not much more generally used in private gardens, particularly in those of amateurs. Of course such pits are used chiefly for small and low-growing plants, that is, from two feet in height to two or three inches. It is, however, to be recollected that many hundreds of plants in the best state of cultivation are under the above height. Thus the greater part of the beautiful and never-fading family of *Erica*, *Pelargonium*, most bulbous-rooted plants, most herbaceous greenhouse plants, and many others, are of this description. The Messrs. Rollinsons, of Tooting, who have been long celebrated for their successful cultivation of heaths, use pits and frames to winter them in: Henderson, of Pine Apple Place, one of the first plant cultivators round London, cultivates thousands of plants by the same means; and in pits simply constructed of old boarding, with earth banked round them, the Messrs. Loddiges now keep a very considerable portion of their immense stock of greenhouse plants, as do many others of the most extensive London cultivators. We state these instances with the view to give confidence to those who are fond of plants and cannot

indulge in them, from supposing it absolutely necessary to have a greenhouse for their protection.

To the genera enumerated as fit plants for the Protecting Tent, (*which see*,) many more might be added as calculated for the Cold Pit: indeed, it is more difficult to say what plants, strictly greenhouse ones, will not thrive in such a structure, than to enumerate those that will. Those in the following list, however, are capable of being well cultivated in the Cold Pit.

We have been principally induced to compile this List with a view to direct the attention of cultivators, particularly amateur ones, to the possibility of indulging in the growth of exotic plants without going to the expense of erecting greenhouses for their protection. We shall also, from a somewhat similar motive, prepare an extensive List of Plants, under the head of Acclimatizing, which have hitherto been considered as strictly inhabitants of the Greenhouse, but which experience has proved will stand in the open air of our best-situated gardens in ordinary seasons.

## SELECT LIST OF COLD PIT PLANTS.

- Maytenus boaria  
 Olea fragrans  
     europæa, *vars.*  
 Jasminum glaucum  
     acuminatum  
     divaricatum  
     azoricum  
     odoratissimum  
     grandiflorum  
     capense  
 Notelæa, *all the genus.*  
 Veronica parviflora  
     decussata  
     perfoliata  
 Campylanthus salsoloides  
 Calceolaria, *all the genus.*  
 Salvia canariensis  
     aurea  
     angustifolia  
     leucantha  
     dentata  
     formosa  
     mexicana  
     scabra  
     rugosa  
 Gunnera perpensa  
 Fontanesia phillyræoides  
 Cneorum, *all the genus.*  
 Spermazyron striatum  
 Ixia, *all the genus,* as also Trichonema,  
     Geissorhiza, Sparaxis, Tritonia, Wat-  
     sonia, Babinia, Lapeyrousia, Gladio-  
     lus, Synnotia, Antholyza, Anoma-  
     theca, Anisanthus, Wachendorfia,  
     Hæmodorum, Aristeia, Dilatris,  
     Brodiaea, Moræa, Renealmia, Bo-  
     bartia, Vieusseuxia.  
 Sisyrinchium bermudianum  
     convolulum  
     tenuifolium  
     luteum  
     californicum  
     iridifolium  
     laxum  
 Persoonia, *most of the genus.*  
 Grevillea, *most of the genus.*  
 Hakea, *most of the genus.*  
 Lomatia, *most of the genus.*  
 Banksia, *most of the genus.*  
 Dryandra, *most of the genus.*
- Opercularia, *all the genus.*  
 Camphorosma monspeliaca  
 Elæagnus orientalis  
     arborea  
     acuminata  
 Globularia longifolia  
     Alypum  
     spinosa  
 Scabiosa cretica  
 Rubia splendens  
     angustifolia  
 Asperula brevifolia  
 Callicarpa americana  
     rubella  
 Penæa, *all the genus.*  
 Blæria, *all the genus.*  
 Pavetta arenosa  
 Ernodea montana  
 Curtisia faginea  
 Hartogia capensis  
 Ilex chinensis  
     crocea  
     Parado  
     Dahoon  
     angustifolia  
     vomitoria  
 Plumbago capensis  
 Cyclamen, *all the genus.*  
 Logania floribunda  
     latifolia  
 Vestia lycioides  
 Verbascum spinosum  
 Convolvulus pannifolius  
     farinosus  
     Cenorum  
     linearis  
     floridus  
 Lubinia atropurpurea  
 Azalea indica, *and its varieties.*  
 Nerium Oleander, *and its varieties.*  
 Sideroxylon inerme  
 Arduina bispinosa  
 Pæderia fœtida  
 Solanum crispum  
     Balbesii  
 Campanula aurea  
     mollis  
     saxatilis  
     fruticosa  
 Lobelia Tupa

- Lobelia bellidifolia  
     hirsuta  
     lutea  
     pubescens  
     ilicifolia  
     erinus  
     crenata  
     decumbens  
     coronopifolia  
 Trachelium cæruleum  
     diffusum  
 Caprifolium japonicum  
     flexuosum  
 Serissa foetida  
     flore pleno  
 Gardenia florida  
     radicans  
 Mussænda pubescens  
 Pinckneya pubens  
 Celastrus lucida  
     cassinoides  
     cymosa  
 Euonymus japonicum  
 Ceanothus microphylla  
     asiatica  
     africana  
     azurea  
 Stavia radiata  
     glutinosa  
 Pomaderris, *all the genus.*  
 Pittosporum, *all the genus, ferrugine-  
     um excepted.*  
 Bursaria spinosa  
 Hovenia dulcis  
     inæqualis  
 Viola arborescens  
 Chenolea diffusa  
 Gentiana viscosa  
 Bumalda triflora  
 Cussonia spicata  
     thyrsiflora  
 Anabasis tameriscifolia  
 Kochia prostrata  
     sericea  
 Bosea Yervamora  
 Ulmus chinensis  
 Bubon Galbanum  
     laevigatum  
 Bupleurum spinosum  
     coriaceum  
     frutescens  
 Vibernum odoratissimum  
 Rhus, *all the Cape of Good Hope  
     species.*  
 Cassine capensis  
     Colpoon  
 Linum flavum  
     suffruticosum  
     arboereum  
     narbonense  
 Statice auriculæfolia  
     emarginata  
     cordata  
     scabra  
     spathulata
- Statice purpurata  
     pectinata  
     suffruticosa  
     sinuata  
     mucronata  
     macrophylla  
     ægyptiaca  
 Anigozanthos, *all the genus.*  
 Hæmanthus, *all the genus.*  
 Cyrtanthus, *all the genus.*  
 Brunsvigia, *all the genus.*  
 Nerine, *nearly all the genus.*  
 Amaryllis, *nearly all the genus, and all  
     the English hybrids.*  
 Vallota purpurea  
 Zepheranthus, *all the genus.*  
 Doryanthus excelsa  
 Gethyllus, *all the genus.*  
 Alstroemeria, *all the genus.*  
 Hypoxis, *nearly all the genus.*  
 Agapanthus, *all the genus.*  
 Blandfordia nobilis  
 Uvularia chinensis  
 Ophiopogon japonicus  
     spicatus  
 Eucomis, *all the genus.*  
 Brodiaëa, *all the genus.*  
 Sowerbæa juncea  
 Albuca, *all the genus.*  
 Anthericum, *most of the genus.*  
 Arthropodium paniculatum  
     cirratum  
 Dianella, *all the genus.*  
 Asparagus albus  
     acutifolius  
 Drimia, *all the genus.*  
 Lachenalia, *all the genus.*  
 Phormium tenax  
 Prinos lucidus  
 Nandina domestica  
 Canarina campanulata  
 Disandra prostrata  
 Calla æthiopica  
     aromatica  
 Ceptus, *all the genus.*  
 Tropæolum, *all the genus.*  
 Corræa, *all the genus.*  
 Bæckia, *all the genus.*  
 Erica, *most of the genus.*  
 Fuchsia, *all the genus.*  
 Vaccineum myrtifolium  
 Daphne odora  
 Gnidia simplex  
 Laurus camphora  
     indica  
     foetens  
 Anagyris foetida  
     latifolia  
     indica  
 Virgilia capensis  
     intrusa  
 Baptisia perfoliata  
 Chorizema, *most of the genus.*  
 Callistachys ovatus  
     lanceolatus

Brachysema latifolium  
     undulatum  
 Eutaxia, *all the genus.*  
 Pultenæa, *most of the genus.*  
 Ruta albiflora  
     pinnata  
 Rhododendron arboreum  
     campanulatum  
 Enkianthus, *all the genus.*  
 Arbutus canariensis  
     phillyreæfolia  
     serratifolia  
     mucronata  
 Clethra arborea  
 Royena, *all the genus.*  
 Cunonia capensis  
 Saxifraga ligulata  
     sarmentosa  
     congesta  
 Dianthus arboreus  
     fruticosus  
     crenatus  
 Oxalis, *all the genus.*  
 Lychnis coronata  
 Bejaria racemosa  
 Callicoma serratifolia  
 Reseda scoparia  
     fruticulosa  
 Sempervivum, *most of the genus.*  
 Leptospermum, *all the genus.*  
 Fabricia, *all the genus.*  
 Metrosideros, *most of the genus.*  
 Myrtus communis *et vars.*  
 Eucalyptus, *all the genus.*  
 Prunus prostrata  
 Photinia serrulata  
     arbutifolia  
     dubia  
 Raphiolepis indica  
     rubra  
     salicifolia  
 Eriobotrya japonica  
 Mesembryanthemum, *many species.*  
 Rosa berberifolia  
     involuta  
     odoratissima  
     Lawranceana  
     microphylla  
 Rubus rosæfolius  
     pinnatus  
     rugosus  
 Capparis spinosa  
 Sarracenia, *all the genus.*  
 Helianthemum, *all the genus requiring protection.*  
 Bauera, *all the genus.*  
 Hibbertia, *all the genus.*  
 Reaumuria hypericoides  
 Illicium, *all the genus.*  
 Magnolia conspicua  
     obovata  
     tomentosa  
     pumila  
     fuscata  
     annonæfolia

Anemone vitifolia  
     capensis  
 Clematis chinensis  
     Seiboldii  
     azurea grandiflora *of the gardens.*  
     balearica  
     aristata  
 Knowltonia rigida  
     vesicatoria  
 Teucrium, *all the species requiring protection.*  
 Westringia, *all the genus.*  
 Satureja juliana  
     Teneriffæ  
     græca  
     tenuifolia  
 Thymra spicata  
     verticillata  
 Lavandula Stoechas  
     viridis  
     dentata  
     pinnata  
 Sideritis canariensis  
     candicans  
     syrica  
     taurica  
     incana  
     cretica  
 Marrubium Pseudodictamnus  
 Phlomis Lychnitis  
 Leonotis Leonurus  
     ovata  
 Origanum Dictamnus  
     sipyleum  
 Thymus Mastichina  
     cephalotus  
     villosus  
 Dracocephalum canariense  
 Scutellaria cretica  
 Prasium majus  
     minus  
 Melianthus major  
     minor  
 Aloysia citriodora  
 Selago, *all the species.*  
 Verbena, *all the species requiring protection.*  
 Stenochilus glabra  
     maculata  
 Halleria lucida  
 Antirrhinum molle  
     Asarina  
 Linaria triornithophora  
     bipartita  
     tristis  
 Mimulus glutinosa  
 Isoplexis canariensis  
     sceptrum  
 Manulea viscosa  
     rubra  
 Alonsoa acutifolia  
     incisifolia  
     linearis  
 Mathiola odoratissima

- Mathiola tristis  
 Cheiranthus, *all the species requiring protection.*  
 Iberis semperflorens  
     gibraltarica  
 Galaxia ovata  
     graminea  
 Erodium, *all the species requiring protection.*  
 Pelargonium, *all the genus and varieties.*  
 Geranium anemonefolia  
 Malva, *all the Cape of Good Hope species.*  
 Lavatera micans  
     Olbia  
     hispida  
     triloba  
 Pavonia præmorsa  
 Hibiscus Patersonii  
     acerifolius  
     Manihot  
     pedunculatus  
     strigosus  
 Camellia, *all the varieties.*  
 Muraltia Heisteria  
     mixta  
 Mundia spinosa  
 Erythrina herbacea  
     caffra  
     Crista-galli  
     laurifolia  
 Borbonia, *all the genus.*  
 Crotalaria cordifolia  
     purpurea  
 Templetonia retusa  
     glaucæ  
 Goodia lotifolia  
     pubescens  
 Loddigesia oxalidifolia  
 Spartium, *all the species requiring protection.*  
 Genista, *all the species requiring protection.*  
 Ononis, *all the species requiring protection.*  
 Anthyllis, *all the species requiring protection.*  
 Amorpha microphylla  
     pubescens  
     canescens  
     nana  
     croceo-lanata  
 Glycine reniformis  
 Cytisus, *all the species requiring protection.*  
 Swainsonia galegifolia  
     coronillifolia  
 Coronilla glauca  
     valentina  
     viminalis  
     coronata  
     minima  
 Psoralea, *all the species requiring protection.*
- Lotus jacobæus, *et var. lutea.*  
     creticus  
 Dorycnium monspeliense  
 Medicago arborea  
 Beaufortia decussata  
     sparsa  
 Symplocos tinctoria  
     sinica  
 Citrus, *all the varieties.*  
 Hypericum foliosum  
     floribunda  
     canariense  
     monogynum  
     balearicum  
     rosmarinifolium  
     glaucum  
     Coris  
     glandulosum  
     reflexum  
 Ascyrum, *all the genus.*  
 Chrysocoma comaurea  
     cernua  
     scabra  
 Tarchonanthus camphoratus  
 Ixodia achillæoides  
 Artemisia argentea  
     judaica  
     valentina  
     tenuifolia  
     chinensis  
 Baccharis, *all the species requiring protection.*  
 Senecio elegans, *et vars.*  
 Aster, *all the species requiring protection.*  
 Cineraria, *all the species requiring protection.*  
 Chrysanthemum pinnatifidum  
     indicum  
     sinense, *with its vars.*  
*Vide Select List of Chrysanthemums.*  
 Pyrethrum, *all the species requiring protection.*  
 Buphthalmum frutescens  
     arborescens  
     sericeum  
 Callamia, *all the genus.*  
 Berckheya, *all the genus.*  
 Didelta, *all the genus.*  
 Gazania, *all the genus.*  
 Arctotheca repens  
 Sphenogyne, *all the genus.*  
 Calendula, *all the species requiring protection.*  
 Arctotis, *all the genus.*  
 Osteospermum, *all the genus.*  
 Othonna, *all the genus.*  
 Hippia frutescens  
 Eriocephalus, *all the genus.*  
 Oedera prolifera  
 Stœbe, *all the genus.*  
 Cassinia aurea  
     leptophylla  
 Stylidium adnatum  
 Gunnera perpensa



*Casuarina*, all the genus.  
*Schizandra coccinea*  
*Tranzeria*, all the genus.  
*Myrica*, all the genus requiring protection.  
*Pistacia atlantica*  
     *Lentiscus*  
*Xerotes longifolia*  
     *rigida*  
*Schinus molle*  
     *dentata*  
*Euclea racemosa*  
     *undulata*  
*Cliffortia*, all the genus.  
*Petunia*, all the genus.  
*Escallonia*, all the genus.  
*Cyclobothra*, all the genus.  
*Calochortus*, all the genus.

*Calampelis scabra*  
*Adesmia microphylla*  
*Anagallis*, all the genus.  
*Berberis*, all the species requiring protection.  
*Gardoquia Gilliesii*  
*Kageneckia cratægoides*  
*Leptostelma maximum*  
*Loasa hispida*  
     *incana*  
*Lomaria Patersoni*  
     *lanceolata*  
*Lophospermum erubescens*  
*Selago Gillii*  
*Sophora macrocarpa*  
*Sollya heterophylla*  
*Sphacele campanulata*.



## STOVE, OR TROPICAL PLANTS.

THE cultivation of tropical plants is much more limited than that of the other exotics we have treated of, and is, consequently, much less understood, nor does it appear that they will ever become so generally popular in this country, on account of the great expense attending their culture. There is happily, however, a variety of tastes in regard to plants, as in all other matters, and hence we find some directing their attention to this particular department with much zeal and perseverance.

Stove plants are exceedingly interesting, and many of them present a most splendid appearance, both in foliage and blossom. Amongst them we may enumerate, as vegetable curiosities, the extraordinary *Nepenthes distillatoria*, or Chinese pitcher plant, the arborescent ferns of St. Helena and the West Indies, the bread-fruit tree, with many other fruits of great delicacy and richness of flavour; the palm, some of the leaves of which would cover an entire dwelling, and the fruit of others furnish the food of its inhabitants. Many of our most important vegetable medicines, such as jesuit's-bark, balsam of copavi, cinnamon, jalap, ipecacuana, and many others, are found amongst them: others are intimately connected with the arts; Jamaica ebony, mahogany, lancewood, teak, and the cotton-tree have become amongst our most valuable commercial importations; and as articles almost indispensable for food may be mentioned coffee, sago, chocolate, pepper, arrowroot, sugar, and ginger, and all the other spices.

Stoves have hitherto been considered as of two kinds only, viz., the dry stove, and the humid, or moist stove; and indeed this distinction has been far from being sufficiently attended to. In the former are cultivated plants requiring a temperature varying from a minimum of sixty degrees to ninety degrees as a maximum, and notwithstanding this great heat, requiring, or rather receiving, comparatively but little water; while the other, with a corresponding high temperature, can scarcely be kept too moist.

The improvements of the present age have suggested the propriety of

a third kind of stove, in which are cultivated a section of plants which for singularity of structure, elegance of flowering, and often a high degree of the most delightful fragrance, is not approached by any plants hitherto discovered. This structure is termed the Orchideous House, the most complete specimens of which are those of Messrs. Loddiges, Rollenson's, and Knight's, and we may add that, so far as our observation has extended, they are the only commercial cultivators who appear rightly to understand the cultivation of these extraordinary and at present fashionable plants. It might appear invidious were we to pass over the Clapton nursery without mention, as it is well known that the highly respectable proprietor, Mr. Low, has been at great expense in sending out collectors to enrich his own and facilitate the collections of private individuals.

#### ON THE ERECTION OF STOVES FOR TROPICAL PLANTS.

We have in another part of this work treated somewhat at large on the subject of hot-house architecture: it remains only for us to state here that structures intended for the cultivation of stove or tropical plants should be rendered as close as possible by adopting the most approved modes of glazing, by which means the cold air will be prevented from entering the house in too great a quantity, and in consequence a vast economy in the consumption of fuel will be the result. It should always be kept in mind, that the smaller the quantity of fire heat applied to plants the better, because the more it is used the more highly rarefied will the air within the house become, and consequently the less fit for plants to live in.

#### VENTILATION.

The degree of ventilation required in the stove is of much importance. Putting the laps, and having few openings or moveable lights, will effectually exclude the cold and retain the warm air, admitting at the same time a sufficiency of fresh for the plants, for air becomes lighter, and has a tendency to ascend, when in a heated state, and to descend, but much more rapidly, when in a cold state. Hence the top of a hot-house is always the warmest, and for that reason flues, hot-water or steam pipes ought always to be placed as near to the floor as possible, but so as to be clear of it.

The nature of heated air being thus far understood, it follows that in

ventilating a hot-house the operation ought to begin by letting down the top lights, or opening the top ventilators (if such exist), to an extent varying according to the state of the weather, for opening either to the extent of two inches when the external air is at the freezing point will be equal to opening the same to the extent of four inches when the external air is about forty-five or fifty degrees of temperature, or to a foot or more when the thermometer indicates summer heat in the open air, because then the external and internal air is nearly upon a par, and the circulation is nearly stationary, whereas in the former cases the circulation is extremely rapid; the cold air without, by its gravity, forcing its way into every little opening over the whole surface of the house, and forcing the warmer and lighter air out of the top openings; in this way the whole volume of air within a stove is changed in a very short time. It is necessary for summer operations to have some of the front or lower lights in the stove moveable, or to have (what we think a better plan) ventilators in the front or parapet wall. By a judicious working of these in conjunction with the top lights, ventilation will be most effectually attained. There are few things in gardening less understood than the theory of ventilation, although it is daily in use in every kind of structure, from the hand-glass to the most magnificent conservatory; the operator too often opening that part of the structure most convenient to himself, without once thinking of the consequences. We believe that the first correct principles upon this subject were laid down about thirty years ago, by W. Atkinson, Esq., and first exemplified in the hot-house of the Earl of Mansfield, at Scoone Palace, in Perthshire, under his superintendence. We remember well the opposition his theory met with amongst practical men long before we had the pleasure of that excellent person's acquaintance, to whom we owe far more information on the subject of hot-house architecture than to all the books we have perused.

Some very curious mechanical propositions have been advanced by Mr. Kewley and others, on the possibility of constructing self-acting ventilators; but these have not as yet arrived at that degree of perfection to warrant our recommending them.

#### HEATING.

Next to ventilation, as respects houses for the cultivation of tropical plants, is the subject of a judicious and economical method of heating them; but this subject we have treated on so fully in the early part of

this work as to leave us little to add here, beyond the recommendation of laying down a sufficient number of pipes, if for hot water, or properly constructed flues, if heating by that means be preferred, and to bear in mind that it is better to have two small furnaces to one house than one large one, both for the more equal diffusion of heat and economy of fuel.

## WATER.

Water being an element so essentially necessary to the existence of plants, and as it is required in abundance where tropical plants are grown, we would recommend that it be laid on by pipes from some convenient source, and that arrangements should be made for retaining that which falls on the roof in time of rain in a tank, cistern, or reservoir of sufficient capacity to contain a supply during the droughts of summer, at which time it is most required. This cistern should be placed over the fire-place, or near to it, so that the water it contains may always be of a proper temperature for immediate application to the plants. And that this may be the more completely accomplished, a pipe of two inches diameter or so may be carried down from the cistern to the side of the furnace; but without bringing it in immediate contact with the fire, merely passing it along one side of the furnace and making it re-enter the cistern again near to its surface. The column of water occupying this pipe will become heated by passing along near to the fire: a circulation will thus be created, which will render the whole mass of water in the cistern of a genial warmth, and fit for use. A mode of diffusing water in stoves has been long in operation in the extensive palm stove of Messrs. Loddiges, by means of small leaden pipes, arranged over the inner surface of the roof: these pipes being perforated with many small holes, and being subjected to considerable pressure, when the water is let on, it is thrown over the house like a fine shower of rain. This is a most ingenious mode of watering, and well calculated for the purpose Messrs. Loddiges intended it, which is, to water their immense palms and other very large tropical trees, which, from their great size, are not likely to be injured by too copious a supply: for smaller and more delicate plants, however, and for plant-stoves in general, this plan is objectionable, because the diffusion is so equal over the whole house that such plants as do not require it, nay, that may be injured by it, have an equal share with those which require it the most. The application of water being a matter of much consequence to all plants, an injudicious use of it by giving too much is as bad as giving too little. Plants, therefore, when considered

individually, must be watered by the hand, and the mind directed at the same time to the state that each individual is found to be in, and also its nature and disposition, for some plants require much, while others require little, of this element.

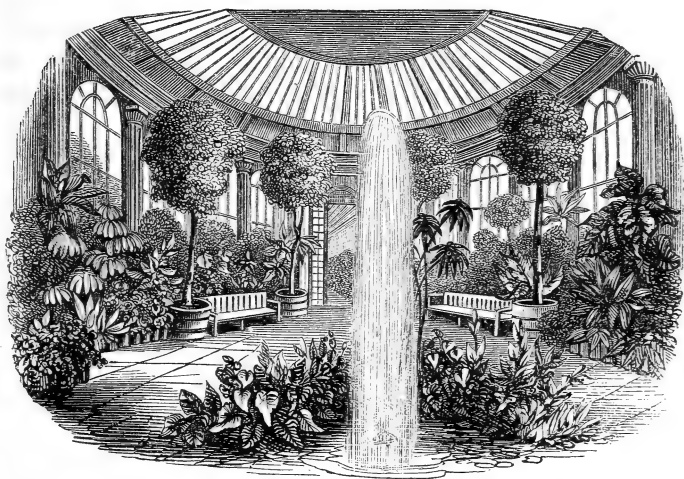
#### BOTTOM HEAT.

Bottom heat, as a general rule, has long ago been abandoned by the best cultivators in this country, but pertinaciously adhered to by most of the gardeners on the continent. Experience has proved the advantage of the change, both by the saving effected in the purchase of tan, and lessening of labour, and the benefit the plants have experienced from it; and this can be accounted for on rational principles, for as all natural heat is derived from the sun, and is diffused in the atmosphere which surrounds plants in their natural state, so the heat to stove-plants should in like manner be derived from the atmosphere of the house, and not, as in former practice, from beds of tan, leaves, or other fermentable matter placed under them. But although this rule holds good in general practice, there are extraordinary cases where it must be deviated from, and which will be noticed in the proper place. The plants in general should stand on a dry, level surface, formed of gravel, scoriæ, or similar materials, capable of allowing a free draining for the superfluous water.

#### THE SIZE AND FORM OF TROPICAL PLANT STOVES.

The size of plant stoves, as we have remarked when treating of green-houses, depends on a variety of circumstances, of which the taste, means, and object of the proprietor are the principal. Few of any extraordinary dimensions have been erected in Britain, a variety of causes combining to operate against them. Those at Sion, a view of which we have chosen for one of our illustrations, are the most extensive in the neighbourhood of London, and those erecting at Chatsworth and Woburn Abbey, the most magnificent in the country. The taste for plants is more generally diffused in England than in any other country, but that taste is chiefly confined to people of moderate fortunes, whose plant erections must of necessity be of moderate dimensions also. The government in this respect is much behind that of France, Austria, or Prussia, each of which has houses of vast dimensions for the cultivation of the plants of warmer climates. No one can view the houses in the *Jardin des Plantes* at Paris, or those at Schonbrunn, or Rennwegg, in Germany, without regretting that

we should be in this respect so much behind our less wealthy neighbours. We are by no means advocates for large hot-houses generally, but we think that such a garden as Kew should contain one house at least equal to that at Schonbrunn, of which Townson, a traveller of the last century, observes that the hot-houses "are the most spacious that have yet been constructed in Europe; the trees of the tropics there develop their branches at full liberty, and bear flowers and fruits." The annexed sketch will give some idea of a part of this extensive stove, as it at present exists.



To cultivate Tropical plants in the first degree of excellence, requires separate houses for different sections of plants; and as we have shown, we hope pretty clearly, when treating of greenhouse plants, the utility of these sub-divisions, we shall proceed to sketch out what we consider the best sub-divisions for natives of the tropics, which ought to be as follows:—  
THE HUMID STOVE, THE DRY STOVE, THE ORCHIDÆ STOVE, THE AQUARIUM, THE PALM STOVE, THE TROPICAL FRUIT STOVE, THE SCITAMINEÆ OR REEDY PLANT STOVE, and THE CRYPTOGAMIC STOVE.

The latter of these is quite indispensable where the cultivation of the plants belonging to them are indulged in; but as these can only be expected in establishments of the highest order, we shall be brief in our observations on them, at least for the present, and proceed to describe more fully the three first, as being by far more generally in use.

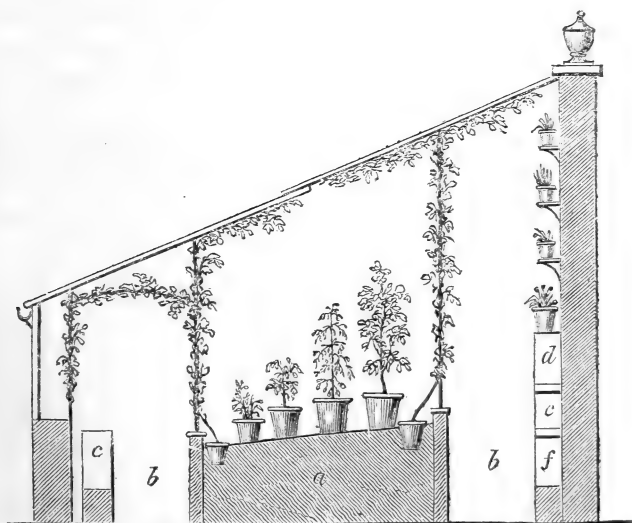
Tropical plant culture requires also another species of improvement, namely, distinguishing what plants really require the temperature of the stove from those which do not ; for there are some in most collections that would thrive much better if kept in the greenhouse or conservatory.

Some have recommended a botanical or systematic arrangement for plants in houses ; we can, however, see no real utility in the plan, beyond that of arranging them into groups or sections suitable for their better culture. No complete system of scientific arrangement can possibly be illustrated by plants in houses, because in many natural orders not one single specimen requiring protection is to be found, and in many others, the plants of which may be more tender, the culture they require is diametrically opposite in some genera. The arrangement we have proposed, however, admits of a very pleasing sub-arrangement in respect to some orders which require nearly the same mode of treatment. For instance, the numerous family of heaths (*Erica*) may be arranged in the heathery, so that each species may follow that most nearly related to it, without interfering with the routine of culture. The same may be also said of succulent plants and bulbs ; but then it should be remembered that in neither of these cases do the plants all belong to one natural order, strictly speaking. Such being the case, therefore, we think few will attempt any other mode of arrangement than that we have pointed out, or perhaps one founded upon it, better calculated to suit the local circumstances of the collection.



## THE HUMID OR MOIST STOVE.

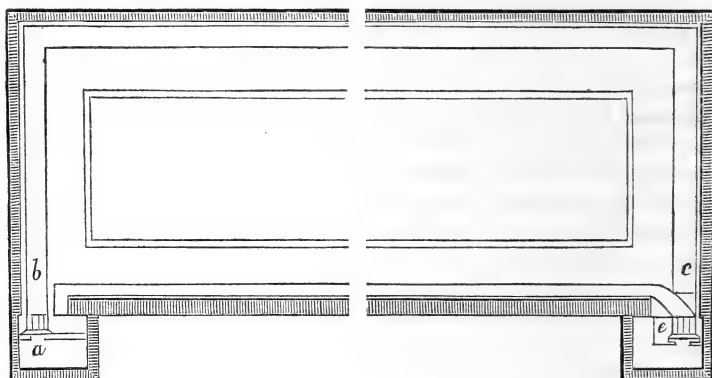
IN the construction of a stove of this description, which we may here observe is by far the most common in use, much depends on the taste and object of the owner, the kind of collection that he intends to cultivate, and whether he is ambitious of possessing specimens of extraordinary magnitude, or is content with small-growing and free-flowering kinds. We have hitherto in these brief observations recommended rather low houses, as being best calculated for the growth of fine-flowering plants that are not intended to be allowed to attain a very large size : however, the case materially differs when specimens of large growth are more desirable, and lofty and extensive structures must be formed for them ; and,



therefore, in this, as in all similar cases, the size, particularly the light ought to be regulated by the description of plants intended to be culti

vated. For example, palms, musas, &c., require houses of the greatest altitude to enable them to develop their fronds and leaves to their fullest extent.

A very good stove for the culture of such plants as require with a high temperature a corresponding degree of humidity, or indeed for general purposes, may be of any required length, and ten or twelve feet high at the back, and from twelve to sixteen feet in width. Such a house should have a bed or platform in the middle, as at *a*, a walk, *b b*, all round, three feet in breadth, and the flues, *c*, in front, and *d f* at the back, over which a trellised platform should be placed for the reception of plants, both over the front and topmost back flue also. If hot water or steam pipes be used in preference to smoke flues, they should of course occupy the same places marked as flues in the section. A neat trellised



arch may be placed under every other rafter over the front footpath, and these joined with other arches of a single half-inch rod of iron, to which the most delicate climbing plants may be trained. The stronger growing kinds to be planted in large pots plunged in the bed, and trained to upright rods of iron under every rafter, both for support and ornament. Over the back flues should be placed three courses of shelves for the reception of plants while in a dormant state, and which require to be kept dry, such as *Gloxinia*, *Gesneria*, &c. Such a house as this, forty feet long, may be heated by one fire, either by a common smoke flue or hot-water boiler and pipes; but as the additional expense in the first instance will not be much, it will be better to have two furnaces, the second to be considered merely as supplementary, and to be used only in case

of accident, or extremely hard frosts. The first furnace is placed in the shed behind, at *a*, in ground plan, and over it should be placed a capacious cistern, to be supplied with water, and regulated by a ball-cock. This water will always be in a state sufficiently warm to be applied to the plants, and for greater convenience it should be admitted into the house by means of a short pipe through the back wall. This first course of flues to enter the house at *b*, proceed round the front and both ends to *c*, where it will return along the back flue *d* in the section, to the point where it first entered, and escape by the chimney. The second fire-flue to enter at *e*, and make two turns in the back flues at *c f*, and escape by the chimney over the point where it first entered the house. Such a house as this is capable of growing tropical plants of moderate size to the fullest degree of excellence.

To those ambitious of more splendid houses, we can with safety, we presume, recommend the sketch at page 233, which shows the interior of a splendid conservatory, one hundred feet in length, and fifty feet in width, and twenty-five feet in greatest height. Such a structure, dedicated to the cultivation of tropical plants, would have a very imposing effect, and be at the same time extremely well calculated for their growth. The roof is composed of two spans, each springing from the top of the ornamental iron columns, of which there are four rows, and being hollow to conduct the water of the roof to a large reservoir underneath the floor, from whence it is pumped up as required for the use of the house, and supply of the steam or hot-water boilers employed in heating the atmosphere of the structure. Those parts of the roof which are over the foot-paths are opaque, and upon them is placed a cast-iron trellised grating for the purpose of walking upon when necessary to repair the roof or ventilator, or even as an elevated promenade, from whence not only the plants within may be viewed, but the garden and grounds around. The species of elevated promenade is very fashionable on the continent, and one of the best specimens of the kind we have seen is that of the immense range of exotic plant-houses erected by the Duc d'Arenberg, at Enghien, in the Netherlands, and which is four hundred and sixty feet long.

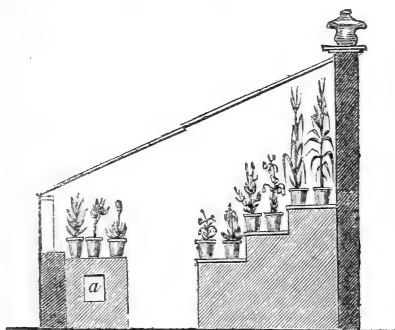
The proportions of the house, of which our figure will give some idea, are, we think, perfect; its length, however, might be extended without affecting the perfection of the principle, which we take to be in the breadth, and more especially in the height. Houses, such as the centre part of the range at Sion House, (see page 4,) however imposing they may look when viewed from without, are any thing but calculated for

the cultivation of the plants that are grown within. Such lofty houses have much the same effect upon plants, whether planted out in borders or grown in pots, that bell-glasses have upon tender plants placed under them; and, however high the one or the other may be, if we leave the stems and lower parts destitute of branches, the plants will, if permitted, reach their tops. In regard to heating a house for tropical plants, such as that represented by our figure, we should say steam would be the most complete, because such a house, in our opinion, should be connected with the mansion, and if opening into the drawing-room, library, or saloon, would form a splendid connection with them, particularly when seen by candle or gas light. The temperature also would not, particularly at night, be much above that of an ordinary sitting-room, for it should be kept in mind that houses of such dimensions, and which must be always considered as erected more for display than for cultivation, should contain only such plants as will prosper in a temperature of which fifty-seven or sixty degrees may be taken for a minimum. Such being the case, the steam apparatus may be conveniently placed under some part of the building, and the steam which may not be required for the conservatory may be advantageously employed for a variety of domestic purposes, of which the kitchen is not the least important. Hot water no doubt would heat such a house perfectly, but we question whether it could be done upon so economical a scale. The steam or hot-water pipes should be placed in a sufficient chamber under the pavement, extending all round the house, and also through the middle, under the centre walk, the heated air being allowed to ascend through brass ventilators let into the floor at regular distances. Such a structure may be completely constructed of timber, excepting the columns which support the roof, which ought always to be of iron. The opaque part of the roof over the foot paths ought in that case to be of deal, well painted on the outside, and lined also with deal within, leaving a span the thickness of the semi-circular battens, which will prevent the admission of cold, or escape of heat, by inclosing between them a volume of air, which is the best of all non-conductors.

The plants should be all planted in tubs, boxes, or large pots, and plunged in a bed of scoria, or river sand, and covered over with various species of mosses, which can be made very ornamental, and are easily repaired. Were the plants planted out in the beds, as is usually done, the stronger growing sorts would in a short time completely overgrow the tenderer ones, and often the most valuable, and in the course of eighteen months after planting the whole would become a mass of confusion and disorder; whereas, by having the plants portable, their luxuriance would

be limited into something like the space they have to grow in, and if any change in the arrangement suggest itself to the owner, it can be readily effected. The boxes, tubs, or pots may be hid entirely by the mode suggested for the conservatory, and the whole appearance will be as if they were really planted out without any of the inconvenience of that ridiculous practice.

To those who might object to such capacious houses, we would recommend one or more small stoves, according to circumstances, upon the principle exhibited in the annexed diagram. A house to be heated by



one fire, may be fifty feet long, nine feet high at the back, and ten feet wide, having the flue extending along the front and ends. The plants to be placed on a stage, which, to lessen the capacity to be heated, should be solid underneath: the flue in front, although shown with dark lines around it, is to be understood as standing clear on all sides, and having over it at the distance of ten or twelve inches a trellis, on which plants are to be set, and such should be chosen for this situation as require a slight bottom heat, and also require to be placed nearer to the light and air. For private amateurs, or where only a limited collection of tropical plants is to be cultivated, such a house would give every satisfaction.

#### PROPAGATION AND TREATMENT OF TROPICAL PLANTS WHILE YOUNG.

In the propagation of Tropical plants all the known modes are occasionally adopted, but those by cuttings and seeds are the most successful, and, therefore, the most general.

Where Tropical plants are cultivated to any extent, or where a stove or

Tropical conservatory, as above illustrated, is to be supplied, it will be found next to impossible to obtain the necessary supply without a separate structure for their propagation. A pit, therefore, of the description recommended for the growth of Scitamineæ, or Reedy plants, should be erected in the reserve flower-garden, or in the melon or forcing-ground, in which not only a supply of young plants will be brought forward, but also those that are sickly brought into health again, and fitted for their proper places. Such pits being filled with tan, or leaves, and the heat kept up by the application of linings, will be a very good place for raising Tropical seeds, or propagating the plants from cuttings.

#### SEEDS.

Few Tropical plants ripen their seeds in our stoves; our supply, therefore, depends upon importations from the various countries of which they are natives. The best season for sowing the seeds is undoubtedly in the spring; but as these seeds may arrive in autumn, or even during winter, it is better to sow them as soon as they are received, because they of course have been long gathered, and they are also liable to be very much injured by their transition from warm to cold latitudes: indeed, some sorts have been found to be incapable of the change.

A statement has been made by a Danish botanist of credit, that of eighteen hundred sorts sent from Denmark to Calcutta, fourteen hundred vegetated in a few days after sowing, whereas those sent to Europe from Calcutta almost all perished. Many propositions have been made for overcoming this difficulty: packing in charcoal, in closely corked bottles, in sugar, imbedding the seeds in various gums and other mucilaginous matters, have all been tried, but not with any very satisfactory result. "After much experience it has been found that seeds packed loosely in coarse canvass bags, and hung to the ceiling of the cabin of a ship, where they are exposed to light and air, and protected from damp, will retain their vegetative powers much better than when enveloped in wax or tallow, or mixed with sugar or charcoal. No material will preserve seeds so long as coarse brown paper, made from old tarred rope, in which a large quantity of tar is incorporated. Cartridge paper affords seeds no protection whatever. Surrounding seeds with moist earth rammed very hard will also prevent germination, and at the same time retain the vital principle. In general, the most difficult seeds to preserve are those which contain much oil; but there are many exceptions in the case of

the seeds of the Brassica family, mustard, and other cruciferous plants.”  
—*Ency. of Gard.*

As the temperature of this pit must be kept up from sixty degrees to seventy degrees and upwards, it matters not, so far as heat is concerned, at what season the seed be sown: it is the want of sun-heat and light that operates against them while just coming into a state of vegetation, for want of which they are very apt to damp or die off just as they get above the ground. Seeds that arrive from September till December had better be kept unsown, unless it be such as are of large size, or hard shelled, and which require to lie a long time in the ground before germination takes place: these latter may be sown as soon as they are received.

The soil in which Tropical seeds soonest vegetate, is that called vegetable mould of decayed leaves, and a small portion of light, sandy loam. They should be sown in pots of the size called thirty-twos, and these must be well drained, the surface of the mould in them made very smooth and firm, upon which the smallest seeds are to be sown, and covered to about the depth of the diameter of their respective sizes. When sown, the pots should be plunged to the brim in the bed of the pit, providing the heat be not too strong, in which case it will be well to half plunge them first, and afterwards to their full depth. A slight watering should be given them when sown, but this will not be often necessary, particularly during winter, as the steam arising from the bed and linings will be abundant, and by condensing upon the under surface of the glass will fall back on the mould in the shape of dew. Their whole treatment during winter is to regulate the temperature by renewing the linings, for the bed must not be disturbed till spring, and to guard against an extra degree of damp and impurity of air from want of sufficient ventilation.

Seeds as they arrive are to be sown in the same manner. In spring, when the weather becomes mild, a regulation of the seed-bed may take place by removing the seed-pots into another pit or hot-house for a day to allow of the bed being turned, and fresh tan or leaves added; and when that is completed, the pots in which the seedlings are not yet advanced to a state fit for transplanting should be replunged again. Such as are fit for transplanting should be carefully taken out and placed in small pots of the size of small or large sixties, as the case may be. These should be again plunged into the bed, either in the division set apart for seed-pots, or in that in which cuttings are placed. Here they should remain till they have taken with the mould, and can stand the sun without shading. It is necessary that this kind of pit be divided into two or three compartments; one, for example, for seed-pots, one for cuttings, and one

for the young plants, whether from seeds or cuttings, when they are potted off. This is necessary, because the latter require to have more air admitted to them as well as light. There is no difficulty in dividing such a pit at pleasure, because having a boarded partition made to shift from one place to another is all that is required. Thus one or two lights may be enclosed for one purpose, and one or more for another.

Many thick and hard-skinned seeds do not vegetate freely; in such cases it is necessary to steep them in moderately warm water for a few days before they are sown, and to keep them at the same time in a warm place. Mr. Otto, the director of the Berlin Botanic Gardens, in a communication to the Prussian Gardening Society, recommends steeping old seeds, or such as there may be doubts of their vegetating, for twenty-four or forty-eight hours, in a bottle containing oxalic acid, at the end of which period germination will have commenced, which when observed the seeds are to be carefully taken out and sown in the usual manner. He also recommends wetting a woollen cloth with the same acid, on which the seeds will germinate; and also, by watering the mould in which seeds from twenty to forty years old have been sown, with a weak solution of it, he has succeeded in getting up plants, whilst the same sorts sown in the usual manner did not grow at all.

M. Bosse, in the work last quoted, states that the germination of seeds is accelerated by steeping them in malic acid, and observes, that seeds covered with the pulp of rotten apples have been known to vegetate sooner than when treated in the ordinary course.

Some have recommended milk, others diluted muriatic acid, and many pare with a sharp knife the shell or skin of the seed, just round the point through which the embryo shoot is to issue: all or any of these means may be used, but in either case they should be sown as soon as any sign of swelling or growth appears.

If the sowing takes place in spring, which, as we have already observed, is the best time, many of the seeds will germinate in five or six weeks' time, but the larger and hardier sorts may remain for twelve months or longer before any sign of vegetation appears. We notice this, as it not unfrequently happens that seed-pots are emptied and thrown away just as the process of germination is commencing.

#### CUTTINGS.

The majority of Tropical exotics that are furnished with branches are capable of being propagated by cuttings, which should be taken off in



spring, or during summer, when the operation is to be accomplished upon young wood, which always strikes soonest. The best wood for this purpose is the young, firm, fully-formed tips of the lateral branches, but these must have attained their full growth, as well as the leaves upon them, and be made and planted in the cutting-pit if possible before they begin to flag, or their leaves droop. Some cultivators place much importance on the part of the plant from which the cutting is to be taken. Some prefer the tips of the lateral shoots, as above, and think that they produce plants more apt to become free-flowerers, although of less robust habits: others prefer the young upright shoots, taken off early in spring, and think that they make the most handsome plants. We think either may be taken with equal success as to the state of the future plant. The lateral shoots can in general be better spared from the original plant without disfiguring it, and may in all cases be obtained in greater numbers.

The late Cushing, who had most extensive practice in these matters, has these remarks:—"The cuttings of many plants, if taken from the lateral shoots, never become proper erect stems, but are inclined at all times to form an irregular, bushy, weak head: this is not of small importance to such collectors as cultivate plants merely for the flowers, as such heads generally produce them sooner than luxuriant leaders. The lovers of handsome, erect plants, however, choose their cuttings from the upright shoots, early in the season, before they acquire that luxuriance of growth so unfit for the purpose of propagation. The tops of the shoots are to be preferred, unless they happen to flag before being used."

In preparing them for planting, much care is required, and a very old and too general error guarded against, namely, taking off all or shortening most of the leaves, than which nothing is more hurtful and injurious, particularly to evergreens, and such most tropical plants may be considered, as few of them, comparatively, shed their foliage. This is rationally accounted for in the following way: the inherent sap of the cutting being deprived of their leaves, which are the organs of respiration, and having no roots to produce new ones, the sap consequently becomes stagnated in the pores of the wood, which is somewhat similar to the stagnation of blood in animals, and will produce mortification, and finally death. Too many cuttings, unless of the most succulent sorts, should not be taken off at once, and these should be planted as soon as made, and during the process they should be kept as much from the air as possible.

In preparing cuttings, it should be borne in mind that the power of protruding roots rests almost entirely in those parts of the branch or stem

called joints, or where the leaves and buds are already formed. Cuttings, therefore, ought in all cases, excepting in such as the willow, or some few other free-growing shrubs, to be cut transversely across, close under a joint or eye; and this must be done in a careful manner, for every cut produces a fractured or bruised section, so that in separating the cutting from the parent the former ought, of the two, to be the fractured part, and it is to rectify this fracture that we recommend the careful cutting transversely across of that part intended to become the new plant, which if unattended to would rather be disposed to rot and decay than to throw out roots, or form those granular callosities which in many plants form first, and from which roots are certain to issue.

The proper time for taking off cuttings of evergreen plants,—and most tropical plants may be so considered,—is when the sap is in motion, in order that by its returning by the bark, it may form a ring of granular matter, from which roots will protrude; and the point of separation in removing the cutting should be just where the shoot of the present season's growth commences, taking a thin slice of that of last year's growth attached to it; or if at a more advanced period of the season, and in the case of plants which make two growths in the year, taking a small portion of the wood of the first growth, which will have attained a pretty firm consistency, and in general be of a brownish or darkish colour.

All soft-wooded plants not having too much pith will root freely if so taken off. But there are others which are commonly denominated hard-wooded, that root under all circumstances with difficulty. With such plants it has been proposed to remove a ring of the bark previously, and where this operation has taken place, a callus will be formed; and if then separated from the parent and inserted in the ground, roots will be produced. Some hard-wooded plants take a year or upwards to strike root, and some would perhaps never root at all if kept planted in mould in the centre of the pot, even if of the kind most favourable for the plant, but will root if set in sand, or in mould so close to the side of the pot that the cutting may touch the side of it all its length; and some if so placed that their ends may rest on the bottom of the pot, or on pieces of broken potsherd, placed on purpose. In these latter cases a brisk bottom heat is essentially necessary. Some soft-wooded plants will root freely in bottles of water, and it would be exceedingly interesting to ascertain to what extent this practice could be carried.

“The management of cuttings after they are planted depends on the general principle, that where life is feeble all excess of exterior agency must have a tendency to render it extinct. No cutting requires to be

planted deep, though large ones ought to be inserted deeper than small. In the case of evergreens, the leaves ought to be kept from touching the soil, or they will damp or rot off: and in the case of tubular-stalked plants, which are in general not very easily struck, owing to the water lodging in the tube, and rotting the cutting, both ends may in some cases be advantageously inserted in the soil, as, besides a greater certainty of success, there is a chance that two plants may be produced. Too much light, air, water, heat, or cold are alike injurious. To guard against these extremes in tender sorts, the best means hitherto devised, is that of inclosing an atmosphere over the cuttings by means of a hand or bell-glass, according to their delicacy. This preserves a uniform stillness and moisture of atmosphere. Immersing the pot in earth has a tendency to preserve a steady, uniform degree of moisture at their roots, and shading prevents the bad effects of too much light. The only method of regulating the heat is by double or single coverings of glass or mats, or both. A hand-glass placed over a bell-glass will preserve a very constant degree of heat. What that degree of heat ought to be is generally decided by that requisite for the mother plant. Whatever degree of heat is natural to the mother plant when in a growing state will in general be most favourable to the growth of cuttings."—*Ency. Gard.*

Cuttings of stove plants may be planted at almost any season, but of course the dark months of winter are the least favourable, and the spring and early summer months the most so, as the plants are at those periods best furnished with young wood, which, as we have already stated, roots much more freely than old. On the purity of the soil, the late Cushing justly remarks, depends in a great measure the success of many of the tenderer kinds of cuttings, particularly those that are obliged to be kept in a moist heat, as the soil is, when contaminated with other compost, very liable in those situations to cause damp and rottenness by the particles of putrefying matter generally contained in mixed earths, and the properties of which are put in motion by the application of heat. As an exception to this rule may be adduced sand, which is of very great utility to mix with the loam, should it happen to be rather stiff for the nature of the cutting; but then the sand proper for this use is of so pure a nature in itself, that it is evident it cannot have the effect noticed above.

Cuttings should be planted as soon after they are taken off as possible, and when planted receive a gentle watering, both to refresh them, and to form the sand or mould more closely round them for the exclusion of air. When they have remained for a short time to allow the leaves to become pretty dry, the bell-glasses should be put over those that require

such a covering, and pressed pretty tight into the mould in the pot to exclude the atmospheric air, and prevent it from exhaling the juices of the plants, which is the use of such glasses. The cutting being so circumstanced, all its powers are forced downwards to produce roots, and these will soon prove their existence by producing young leaves and branches.

In small collections, where few cuttings of any individual plants are required to be propagated, some discretion ought to be observed in selecting such as most nearly agree in habits to be placed in the same pot; for if this be not attended to, a difficulty will arise in potting them off, as some kinds will root so much sooner than others, and the process of removing them may be attended with some chance of injury to the others.

The pots should be prepared by being well drained and filled with the mould most congenial to the genus or species, to within a distance of the top about equal to or rather more than the length the cutting is to be inserted. This upper strata is to be filled up with clean sand, and when well watered and pressed tightly down the cuttings are to be planted. This operation requires care, and the dibble or planting-stick should not be sharp-pointed, for if such a one be used, the cuttings which may be of greater diameter than the point of the stick would not rest upon its bottom, but would be suspended, as it were, by the middle by the pressure of the sides of the hole against it, while it is necessary to insure success that the cutting rest upon its base on the bottom of the hole made for it. When the cuttings are planted in the pot, they should then be, for the most part, covered with a bell-glass pressed slightly into the sand, so as to exclude the air. They should then be removed to the pit above described, and either set on the surface of the bed, or plunged into it, as the temperature may be. Many plants strike best when placed in the pit without bell-glasses over them, but of this it would be impossible to form any estimate without enumerating them by name. It may be taken for granted that most soft-wooded free-growing plants will root by this means, while only the hard-wooded and smaller-leaved plants require covering.

Regularity in watering, shading, and wiping the inside, not only of the bell-glasses, but also the lights of the pit, must be attended to, and also that no excess of steam enter the pit from the linings; but against this our pit has some provision. If the cuttings be left too dry, the bark shrivels up, and the foliage drops off, for it should be remembered that tropical plants, with very few exceptions, prefer a humid, mild heat to strike

in, and are much less injured by damp than plants of any other description. The most convenient shading for them is large sheets of coarse packing paper laid over the glasses within the frame, which is both easier done and more certain of remaining without being displaced than any covering applied on the exterior of the pit, which is liable to be blown off, and before such a disaster can be discovered the whole stock of cuttings may be destroyed by the sun.

One great advantage which shading with paper within the frame has over any kind of shading laid over the exterior is, that while the cuttings are effectually shaded by the paper, the sun's rays are not prevented from entering into the pit to dry up damp and prevent an impure atmosphere from being formed, which would be the case if covered with mats, as is too often erroneously practised.

Many of these plants strike root very soon after planting: thus the first set of rooted plants fit for transplanting into separate small pots may be expected in about a fortnight or three weeks, another set in a month or five weeks, and so on, while some will remain unrooted for nine months or a twelvemonth. The cuttings will in general show the progress of the roots by beginning to grow; when this is observed, air should be gradually admitted to them, so that by the time they are fit for potting they may stand, without flagging, the heat of the sun. Shading should be taken off every evening, and as the plants appear to root it should be by degrees reduced till dispensed with entirely.

When the cuttings have rooted sufficiently to insure their safe removal to separate pots, they should be taken very carefully out of the mould or sand in which they have been hitherto growing, and as the preservation of the roots is the principal object to be attended to, it will be well to turn out the contents of the pot carefully on the potting table, so that the roots may be singled out and separated from the mould without breaking or bruising any of them. This is perfectly practicable in regard to the larger growing sorts, but the smaller kinds will require to be taken out in small patches upon the point of a knife or thin piece of wood. When they are separated from the sand or mould in which they have been struck, they should then be as speedily as possible planted into thumbs, or small or large sixties, as their size and condition demand. The mould now to be used is that in which the plant is found to succeed best in when full grown; but in regard to the smaller and more delicate ones, a soil somewhat lighter, and the mould reduced to a finer consistency, will be advisable.

When potted off they should be gently watered, and then placed in

the pit on the surface of the bed, and covered with hand-glasses for a few days till they have taken fresh root in the new soil; these glasses must be progressively removed as the plants get established. It will be necessary also to shade them during the first few days; but this shading, like the removal of the glasses, must be progressively dispensed with.

Their whole culture now depends on the regularity of the supply of air, heat, light, and water, and as they extend in growth, frequent shiftings, until they are of a state to take their place in the stove.

Grafting and inarching are sometimes, but rarely, practised on stove plants, and some species difficult to strike by cuttings are increased by laying.

Some sorts of stove plants, such as *Jacquinia arborea*, are propagated from the leaves, which should in the case of this plant be stripped off and planted round the edge of a pot, filled with sandy leaf-mould, being previously well drained: in six or eight months they will send up a stem which will form the future plant. In like manner the genera *Gloxinia*, *Gesneria*, &c., will from leaves planted in a similar way form tubers from the base of the leaf-stalk, which will the season following send up a shoot and make good plants. This mode of reproduction is frequently had recourse to in the case of succulent plants, such as *Gasteria*, *Aloe*, &c., particularly of those kinds which neither send up suckers nor divide into branches; and many species of plants produce small leaves on their flower-stems, which, as in the case of *Echeveria gibbiflora*, *E. grandifolia*, &c., if laid on the surface of the mould produce plants. But the most curious mode of reproduction we think is that stated by Professor Thouin, that certain flowers and fruits have this property, and as an instance of the former we may state that of the corollas of the *Arum appendiculatum* producing plants in the garden of the Taurida Palace, at St. Petersburg.

#### LAYING TROPICAL PLANTS.

Laying, as a means of multiplying tender exotics, is much less practised in this country now than formerly, when the art of striking by cuttings was but little understood. It is, however, still very universally practised on the continent, where the former and more expeditious mode is less correctly known. In propagating by this means some preliminary arrangements are necessary, because in the cases of tall plants it would be next to impossible to bring their branches down to be laid in a pot of mould upon

the stage or platform. To obviate this difficulty, our inventive neighbours have constantly by them small conical-shaped tin vessels, sometimes slit on one side to allow the shoot to be operated on, and at other times having a hole in the bottom part, up which the shoot is made to pass. These vessels are suspended in some part of the tree itself, or, if more convenient, in some neighbouring tree, so that the shoot can be brought to it without danger of breaking. The vessel being filled with the proper mould, the branch is laid into it, sometimes having been previously ringed, tongued, slit through the middle, and having a small slip of slate or other thin material let into the opening to prevent the wound from healing over, pierced with an awl, or having a notch or thin paring of the bark taken off at that part to be covered with the mould. These modes have all their respective advantages. The mould in the vessel is kept of a proper degree of humidity by enveloping it in moss kept moderately moist. With us, earthenware pots have been manufactured, having a slit down one side, and are used much as described above. When the subject to be operated upon is of flexible habit and near the ground, the laying is more conveniently carried into effect by simply placing pots of mould round the parent plant, and laying the branches in them in the usual manner.

“In laying,” Cushing observes, “choice should be made of the young tender shoots of the present year: the soft bark of which will sooner form a callosity and produce roots than that of the preceding year’s growth. It is particularly necessary to observe whether the plant intended to be laid is of a brittle nature or not, for if it is, it will be necessary that the shoots be pegged gently down to the surface previous to laying, and thus left until the tops naturally acquire a perpendicular direction, which they will do in a few days; without this precaution it would be extremely difficult to cut or tongue them without cracking or breaking them off; but if treated in this manner the most brittle may be laid without danger. It is a conclusion drawn from several experiments, that the layer which is inserted to a proper depth roots sooner and better than that which is laid near the surface; the reason of which is, at a certain depth the air is better excluded, and there is a more regular degree of moisture for the nourishment of the young fibres when they are protruded. No part of the shoots should upon any pretence be covered with the mould, except that which is meant to produce roots, as covering the whole renders it extremely liable to rot.”

## INARCHING TROPICAL PLANTS.

There are some sorts of tropical plants, particularly those that are hard-wooded, that are difficult to increase by other means than by seeds, which are often not easy to procure. Recourse then is had to this mode of propagation, which is sufficiently simple in itself, but requires some nicety in the performance. The first consideration in regard to inarching stove plants is to make choice of proper stocks, and these must always be some of the coarser and free-growing species of the same genus, or one nearly related to it, as for example, the common myrtle for the more delicate sort of *Myrtus* and *Pimenta*, a genus nearly separated from the former, but sufficiently akin to unite by this process; the *Mezereon* and Spurge Laurel for the more delicate species of *Daphne*, the *Magnolia obovata* for the more tender of its family, and the *Olea europea* or *Ligustrum vulgare* var. *sempervirens*, for the tropical species of olives, &c. Having selected the proper kind of stock, which should be as nearly of equal diameter to the scion or branch to be united to it as possible, cut a thin slip about two or three inches long and about one-third of the diameter in thickness of both the stock and the branch to be united to it, and from off the smoothest part of the stem of each. These two cuts must be made as nearly alike as possible, so as to admit of the bark of each being brought together so as to fit exactly, at least on one side, and be fastened together firmly by tying them round with fresh matting. This being done, the joint is to be covered with well-prepared clay, grafting wax, or fine moss, but in such a manner as perfectly to exclude the air. In eight or ten weeks a union will have taken place; at all events about that time they may be partially separated from the parent plant by cutting the inarched shoots better than half way through: if they are united, they will bear the operation without flagging their leaves, and in that case may in the course of a few days more be separated entirely, and be placed in a shady part of the stove, or in the propagating pit, where they will soon make good plants. After three or four weeks the matting may be untied and the top of the stock cut off in a neat manner, applying a little clay to the wound to prevent the air or moisture from acting too powerfully upon it.

## GENERAL TREATMENT OF TROPICAL PLANTS DURING AUTUMN AND WINTER.

By the beginning of September the nights begin to get cold, and often wet; it is then time to prepare the stoves, that is, both the Dry and also



the Moist Stove, for their winter's treatment. In regard to both, ventilation must be gradually lessened, shutting up early in the afternoon, and thereby inclosing as much air heated by the solar rays as will maintain the necessary temperature till morning. This may be sufficient till the second or third week in the month, when slight fires may become necessary, but no positive data can be given on this head, as so much depends upon the state of the weather. The Dry Stove, if the bottom heat be obtained from fermentable matter, such as leaves, tan, &c., should now be regulated by removing a portion of that which has been in a state of fermentation since this time twelvemonth, and by supplying its place with fresh material, to keep up the necessary heat for another season. The flues should be cleared, all necessary repairs of glass, &c., executed, and the house thoroughly cleaned, so as to be in a fit state for the winter. In the Moist Stove the same measures of cleaning, repairing, &c., should be also completed. In both, the supply of water should be lessened, both at the roots and over the tops of the plants, particularly at the former, as plants plunged in any medium always require much less water than those that are exposed to the action of the atmosphere on all sides; sickly plants should also have much less of that element than those that are in perfect health.

By the latter end of September, slight fires may be necessary, particularly in the Dry Stove; in the other, the beginning of October will be soon enough. By recommending artificial heat so early, we must be understood to mean only in a very limited degree, for certainly the excess of this element, and more particularly during autumn and early winter, is productive of much mischief in most collections; and a deficiency of it in February, March, and April, when it is most wanted, is also a fault generally fallen into. All plants, from whatever quarter of the globe they may come, experience a summer and a winter, or some atmospheric change equivalent thereto, during which their functions become torpid to a certain extent, and this may be safely termed their season of rest. In cultivation, something of the same kind should be imitated, and no period is so natural in our northern latitudes as those dark and cheerless months between November and the middle of February. It is contrary to reason and common sense to expect a plant to continue in a state of uninterrupted excitement, and it is also equally erroneous to force a plant, by dint of artificial heat, to grow during the darkest months we have. Our practice is to let tropical plants rest during November, December, and January, and excite them gradually in February, March, and April. The success of this process will be obvious. Air should be admitted on all mild days,

but cold and frosty air carefully excluded, for a very limited quantity is sufficient for tropical plants during their period of repose, and nearly that quantity will find its way into the house through the interstices of the glass and other small openings. The fires should be made in the Dry Stove so as to keep the thermometer at sixty or sixty-five degrees, the latter, if the collection contains many very rare plants. The temperature of the Humid Stove by fire heat may range from fifty-two to sixty or sixty-two degrees. This is a matter, although much insisted on by some, in our opinion of very little consequence, for where, let us ask, is there a spot under the sun whose temperature is uniform to within the range of two or three degrees? Water, whether applied to the roots or over the branches, should, during winter, be rendered tepid before used, as it is equally unnatural and dangerous to apply cold water to plants in a high temperature, and produces consequences somewhat analogous to that of animals while excessively heated drinking or bathing in cold water, as has been elsewhere noticed. When the flues are sufficiently heated, and indeed they ought to be so for short periods occasionally, were it for no other purpose, a fine vapour or steam may be created by pouring water over them. Indeed, the regular steaming of a stove is one of the most important features in its management, and for this purpose it is necessary to throw more heat into the house to create the steam than would be advisable under any other consideration. Steaming through the winter is of less importance than in spring, of which notice will be taken.

#### GENERAL TREATMENT OF TROPICAL PLANTS DURING SPRING AND SUMMER.

Towards the latter end of February, the plants will be beginning to show symptoms of vegetation; this must not be hurried on by the aid of fire heat, but the sun will have sufficient power in fine days to raise the temperature a few degrees. Advantage ought to be taken of such a circumstance to admit a moderate quantity of fresh air, which will be of much importance to the plants, and cause them to send their buds out in a vigorous manner, which all the heat that could be applied to them without the aid of air would not be able to accomplish, but the reverse, and would cause the buds to push weakly and the shoots small, and susceptible of disease and the attacks of insects.

The temperature of the Dry Stove may be gradually raised, between the middle of February and the middle of April, from sixty to seventy degrees, and that of the Moist Stove in like manner, but four or five degrees

less. Air must also be admitted in fine days in much greater quantities than during the preceding months, and the operation of steaming performed every evening during the whole period, and continued as long as there is sufficient heat kept up by fire in the flues; after which the steaming must be performed in the morning, by syringing the plants and walls of the house all over, and keeping it closely shut up till the sun raises the thermometer to eighty or ninety degrees, or higher, when air may then be admitted, to reduce it to its usual temperature. By following this process, those pests of all hothouses, the mealy bug and red spider, will be completely destroyed, neither of which can exist in a high humid temperature or atmosphere, but the reverse is the very medium that will bring them into existence in swarms. This circumstance, upon the first application of steam to hothouses, caused an erroneous notion to be attached to that mode of heating, namely, that by it insects were totally suppressed. No such thing is or can be the case where steam is employed, if kept confined in the pipes: it is by its escape from them that this desirable end is effected; and though it was only where the practice was followed of opening these pipes and allowing a portion of the steam to enter the house, that the insects were found to disappear, yet the whole merit was set down to the credit of this mode of heating. The same effect had been observed in houses in which the process of raising steam by pouring water on the flues had been followed; but keeping the atmosphere of hothouses damp, was at that time rarely thought of, and hence the indifferent success attending the cultivation of tropical plants and fruits when compared to that of the present day. The application of water by a pretty strong syringe upon the plants, answers also two very important ends, viz., the cleansing of them from dust and insects, and also acting as a substitute for wind, which, in respect to giving strength to plants, has been experimentally proved by the late Mr. T. A. Knight, and other vegetable physiologists, to be of much use, particularly to those placed in situations where this natural agent could not act upon them.

The season for shifting tropical plants extends from the end of February to the end of April, at which period the plants begin to grow, and, consequently, to make fresh roots, which is the most proper time for performing this operation on all plants. This should not, however, be deferred later than the end of April, for by that time the plants will have grown considerably, and would thereby experience a great check if disturbed at their roots.

Shifting or re-potting plants is a very necessary branch of culture, for when we consider that the quantity of earth contained in a flowerpot is

so small in comparison to the wants of the plant it has to support, it is natural to suppose that it requires to be changed or augmented, and if this be not done in due time the plants must suffer for want of food. Besides, the mould around the roots becomes, from one cause or other, when left long undisturbed, sour and coagulated, and the plant becomes unable to draw its proper nourishment from it, and of course declines, and becomes either a nuisance in the collection or else perishes altogether.

The operation of shifting differs not from that already laid down in respect to the various sections of greenhouse plants, and need not be repeated here. The soil should be richer and more turfy or porous than is used for other plants, the surface containing the grass or other vegetable matter growing on it: as the supply of water is greater, it will find a more ready escape through it than if it were as compact and finely pulverized as soils usually are.

As the process of shifting goes on, a careful examination should take place for the detection of insects which may find shelter under the matting with which they are tied, or in the cliffs of the branches and in the cracks of the bark: these places should be examined, and washed with a thick lather of soft-soap and sulphur; not that there is much efficacy in either, but the friction will do its share, and the soap will cleanse the plants and soften the bark, while its adhesive property will retain a quantity of the sulphur upon the branches, which, igniting by the heat of the sun, will burn off mildew, and probably the red spider also, should either exist on them. The plants should be all neatly tied up as they may require it, that is, those of flexible habits; but other plants if well grown will rarely require support, and certainly will look much better without a prop than with one. The wood-work of the house should be washed clean at this time, as should also be the inner surface of the glass, and every part of the building made neat and clean for the approaching summer.

Water, air, and judicious pruning are all that is required during summer, unless it may happen that the greenhouse be emptied for two or three months during summer, when the hardiest of the stove plants may be set upon the stages of it, which will considerably thin the stove, much to the benefit of the plants. But we have elsewhere observed that it is not a practice to be recommended, at least where choice greenhouse plants are grown. Many of the more dwarf stove plants, however, may be accommodated for three or four months during summer in a close frame or pit, where they will be quite as warm as if kept in the stove.

Fire-heat should be gradually lessened from the beginning of April till

the middle or end of May, when it may be almost dispensed with. It may also be considerably economised, and the plants thereby benefited, by shutting up the stoves early in the afternoon, so as to inclose as large a portion of solar heat within them as possible: this is a matter sadly overlooked by cultivators in general.

In regard to insects, we have already observed, that by following up the system of steaming no bugs will exist, and as for scale, they will in most cases share a similar fate. The red spider and thrips can only exist in a dry atmosphere; if they make their appearance in any hot-house, it is a clear proof that water has not been supplied in sufficient quantity. There are some cases when water for particular reasons may be withheld from certain plants or parts of a stove: when such is the case, a hot plate of iron held under the part at a distance of two or three feet, and a little flower of brimstone sprinkled gently upon it, will soon destroy them.

CULTURE OF CERTAIN FINE-FLOWERING STOVE PLANTS THAT REQUIRE  
A MODE OF TREATMENT DIFFERENT FROM THE GENERALITY OF  
TROPICAL PLANTS, &C.

GLORIOSA SUPERBA.

This splendid plant, as the name fully indicates, is of great beauty and singularity. It is, nevertheless, but rarely met with in collections, and much more rarely is it seen in flower, although few plants are more easily cultivated and flowered. The following directions by the late J. Sweet, of the Bristol nurseries, have been followed by us for several years, and with complete success:—"Its failure," he justly observes, "arises chiefly from the defective method in which the roots are preserved during their inaction, and from the want of proper treatment when they first vegetate in the spring. Injured at these periods, the plants generally continue through the summer weak and unpromising, throwing up only a few small stems, which do not flower in sufficient strength or beauty." The following is the essence of his judicious practice. In autumn, when the stems have died down and left the root, which is a considerable sized tuber, perfectly ripe, it is removed in the pot and placed upon the top of the hot-house flue, at a safe distance from the fire, the intention being merely to keep the mould round the tuber perfectly dry; one of the shelves on the back wall of the stove will answer as well. Here it is secured from the water which is used in syringing the house, by inverting another pot over it. If the tubers be small, several may be kept in

the same pot during winter, having the mould made firm round them for the exclusion of air: the same mould that they were grown in should be used for this purpose, for fresh earth or sand, he justly observes, would stimulate them to move early. About the second week in March they should be potted, putting one or two, according to their size, into each pot, the pots to be six inches over. The soil most congenial to them is fresh loam, mixed with an equal quantity of peat earth, the loam to be not over-much enriched with dung, nor too heavy. The roots are to be parted if fit for separation, but by no means if they do not part freely. They should be planted about two inches deep, and plunged into a bottom heat equal to ninety-five degrees. Water is sparingly applied at first, but increased after the plants have set a growing; but this must never be applied in great quantities. If kept in a brisk heat, the shoots will extend for six or eight feet, or more, and will require to be trained to a trellis, or under a rafter, when they will flower in great abundance and perfection.

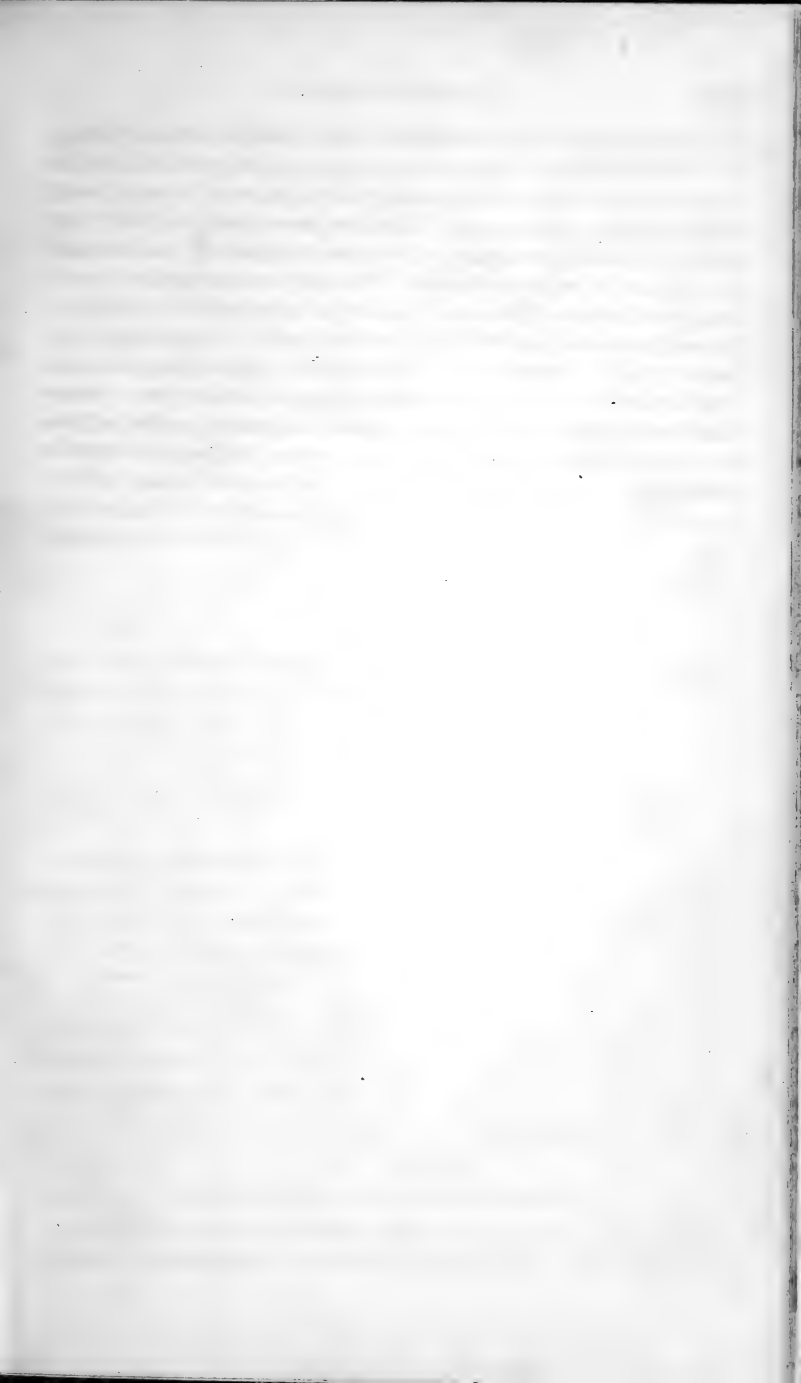
#### IXORA,

a genus of East Indian plants of great beauty, the flowers of which are offered to Ixora, a Malabar idol, in consequence of their splendid appearance. Like the last, this is a genus, some of the species of which are met with in most collections of the tropical plants, while it is very rare to see one of them in flower. On the continent this is different, and we find the *Ixora coccinea*, in particular, cultivated for the public markets.

The culture of the genus is, that they require a period of rest, which continues for four or five months, that is, from July till February, when they may be placed in the greenhouse amongst other plants, or in a pit where frost is completely excluded. In February they should be re-potted, and then plunged in a mild moist heat, or set on the surface of a bed of tan, leaves, or dung, in a close pit, and kept in a temperature of from sixty to seventy degrees of heat. In this pit and by this mode of treatment they will show fine heads of flowers by the beginning of April, and may then be removed to the plant stove to flower, where they will continue in great splendour for a long period.

#### GLOXINIA, SINNINGIA, AND GESNERIA,

are three genera of plants, half bulbous and half herbaceous. They require, after flowering, to be kept moderately dry till their leaves and stalks die





*Sinningia guttata.* |  
Maurice Sabin.

*Begonia plataniifolia.*  
Korn Burchard.



down, or become ripened, when they should be set upon a shelf in the stove and kept dry till they show signs of vegetation, or until it may be desirable to bring them again into a state of active growth. At that period they should be shifted and supplied with water, moderately at first, but as they extend in growth it should be augmented. They should be brought to the front of the house to flower, as they are, particularly the two former genera, of dwarf habits, and would otherwise not be seen to advantage. *Gloxinia* and *Gesneria* may be increased by planting the footstalk with the leaf attached. The other is readily increased by cuttings, and also by the same means.

#### QUISQUALIS AND COMBRETUM.

These are two splendid genera of climbing stove plants, requiring to be planted out in the borders of the house, or in large pots. The principal feature in their culture different from other plants which inhabit the stove is, that while in a deciduous state they should have all the wood of the preceding season's growth cut into one, or at most to two eyes or buds. By this simple process they will flower abundantly: each shoot, for the most part, which springs, will be furnished with a spike of flowers at its termination.

#### IPOMŒA.

This is a genus of fine-flowering climbing plants, with large tuberous roots, and tender herbaceous stems. When these die down the roots should be set upon the shelves, in a dry place, during winter; in spring they may be taken down and repotted, and placed in a close pit for a week or ten days, when they will have begun to vegetate, at which time they should be brought into the stove and placed near a pillar, rafter, or similar support, to which the shoot should be trained.

#### RHEXIA AND MELASTOMA.

Two numerous and fine-flowering families. During winter they require little water, but not to the extent to render them entirely torpid. These, together with many other half-herbaceous plants, should be placed at one end or corner of the stove, that some attention may be paid to them in this respect.

The following judicious remarks on the winter management of tropical

plants, by the author of the botanical article in the "Weekly Chronicle" for November 26th, is so excellent as to meet with our cordial approbation, and is, in our opinion, the best directions in the fewest words we have met with, and corresponds with our own practice:—

"There are two distinct states in the existence of every plant; one, of quietude and repose, the other, of developement and display. The plants which are cultivated in hothouses are chiefly the natives of tropical climates; and an idea has prevailed with many that they require a steady undiminished heat of from sixty to seventy degrees of Fahrenheit's thermometer. If it be supposed that these high degrees of temperature exist at all seasons in the hot countries, a great mistake is committed; for even in the torrid zone, within a few degrees north and south of the line, severe cold is frequently experienced; and in the hilly districts, unequivocal evidence of actual frost is sometimes afforded. Yet the pine-apple, a plant which flourishes with prodigious luxuriance in the pestilential, vapourous atmosphere of Batavia, and in the close woods of Western Africa, bearing the utmost extremes of heat, will nevertheless sustain a degree of cold below that of the mean temperature of our climates in February, without manifest injury. Beauty, perpetual verdure, and floral developements cannot be forced. Plants will not grow at all seasons.

"Repose and sleep are required by all created things; and he who endeavours to keep up by heat—during darkness, gloom, and frost—those effects of vital action which depend upon light and solar influence, must effect his object at the expense of those stores of supply which have been accumulated for the production of the fresh organs and developements in the ensuing spring. Hothouse plants revel in a moist atmosphere and great heat during the advanced spring and summer months; but they seek rest and freedom from offensive damp during winter: the autumn prepares them for this torpid condition. We must, therefore, gradually desist at this season from raising steam; indeed, any degree of moisture beyond that which is yielded by the surface soil of the pots is unnecessary. From the commencement of October to the second week in March, let the air be kept dry, water being given in the smallest quantity which will sustain life, and no bad consequences need be apprehended from the cold of the nights. Frost must, at the same time, be guarded against; and a decline of the mercury should not be suffered below forty-eight degrees; but it is mere waste of health, time, and fuel, to aim at high temperatures, when all they could effect would be to 'draw' the plants, without supplying them with any vigour of constitution. The experienced

gardener is aware of these facts, and the above observations may appear trite and uncalled for. We do not, however, address the practical man, but those persons of refined taste, who are desirous to secure all the advantages which a mode of artificial culture under glass may present; and to those genuine lovers of plants we submit the foregoing remarks."



## SELECT LIST OF MOIST OR HUMID STOVE PLANTS.

## WHITE.

- Largest Hedychium. (*Hedychium maximum*.) Flowers in August, in sandy loam. Division of the root.
- Slender Hedychium. (*Hedychium gracile*.) Flowers in June and July, in sandy loam. Division of the root.
- Broad-leaved Galangale. (*Kæmpferia latifolia*.) Flowers in April and June, in sandy loam. Division of the root.
- Galanga. (*Kæmpferia galanga*.) Flowers from June to September, in sandy loam. Division of the root.
- Upright Globba. (*Globba erecta*.) Flowers from June to July, in sandy loam. Division of the root.
- White Ixora. (*Ixora alba*.) Flowers from June to August, in peaty loam. Cuttings.
- Indian Pavetta. (*Pavetta indica*.) Flowers from August to October, in peaty loam. Cuttings.
- Cingalese Leadwort. (*Plumbago zeylanica*.) Flowers from April to September, in sandy peat. Suckers.
- Sweet-scented Brugmansia. (*Brugmansia suaveolens*.) Flowers from August to September, in loamy peat. Cuttings.
- White-stalked Brugmansia. (*Brugmansia candida*.) Flowers from August to September, in loamy peat. Cuttings.
- Jussæus's Theophrasta. (*Theophrasta Jussiei*.) Flowers in June and July, in rich mould. Seeds.
- Long-leaved Theophrasta. (*Theophrasta longifolia*.) Flowers in June and July, in rich mould. Cuttings.
- Bracelet Jacquinia. (*Jacquinia armillaris*.) Flowers in June and July, in peaty loam. Cuttings.
- Dotted Ardisia. (*Ardisia punctata*.) Flowers in June and August, in sandy loam. Cuttings.
- Racemose Nightshade. (*Solanum racemosum*.) Flowers in July and August, in common mould. Cuttings.
- Netted Nightshade. (*Solanum reticulatum*.) Flowers in June and July, in peaty loam. Cuttings.
- American Rondoletia. (*Rondoletia americana*.) Flowers in August, in sandy peat. Cuttings.
- Panicled Rondoletia. (*Rondoletia paniculata*.) Flowers from June to August, in sandy peat. Cuttings.
- Great-flowered Portlandia. (*Portlandia grandiflora*.) Flowers from June to August, in sandy peat. Cuttings.
- Rooting Gardenia. (*Gardenia radicans*.) Flowers from March to June, in rich mould. Cuttings.
- Sweet-scented Aralia. (*Aralia fragrans*.) Flowers in June and July, in sandy loam. Cuttings.
- Broad-leaved Commersonia. (*Commersonia platyphylla*.) Flowers in June and July, in loamy peat. Cuttings.
- Rough Richardsonia. (*Richardsonia scabra*.) Flowers in September, in loamy peat. Cuttings.
- Pubescent Seaside Grape. (*Coccoloba pubescens*.) Flowers from June to September, in rich mould. Cuttings.
- True Cinnamon. (*Cinnamomum verum*.) Flowers from June to September, in sandy peat. Cuttings.
- Crista Brasilletto. (*Cesalpinia Crista*.) Flowers from June to August, in peaty loam. Seeds.
- Sweet Prosopis. (*Prosopis dulcis*.) Flowers in June and July, in sandy peat. Seeds.

- One-leaved Atalantia. (*Atalantia monophylla*.) Flowers from June to August, in rich mould. Cuttings.
- Dotted Wampa Tree. (*Cookia punctata*.) Flowers in July and August, in rich mould. Cuttings.
- Octandrous Melastoma. (*Melastoma octandra*.) Flowers from July to September, in loamy peat. Cuttings.
- Xiphium-like Tillandsia. (*Tillandsia Xiphioides*.) Flowers in July and August, in sandy peat. Suckers.
- Terminal Dracæna. (*Dracæna terminalis*.) Flowers in June and July, in peaty loam. Cuttings.
- Iron Dracæna. (*Dracæna ferrea*.) Flowers in March and April, in peaty loam. Division of the roots.
- Long-flowered Hillia. (*Hillia longiflora*.) Flowers in February and March, in sandy peat. Cuttings.
- Woolly Sophora. (*Sophora tomentosa*.) Flowers from August to October, in peaty loam. Cuttings.
- Divaricate Mountain Ebony. (*Bauhinia divaricata*.) Flowers in June and September, in loamy peat. Cuttings.
- Lamarck's Mountain Ebony. (*Bauhinia Lamarkiana*.) Flowers from June to September, in sandy loam. Cuttings.
- Superb Bead Tree. (*Melia superba*.) Flowers from June to August, in loamy peat. Cuttings.
- Exotic Murraya. (*Murraya exotica*.) Flowers from August to September, in rich mould. Cuttings.
- Panicked Murraya. (*Murraya paniculata*.) Flowers in July and August, in rich mould. Cuttings.
- White-leaved Chitonina. (*Chitonina albicans*.) Flowers in July and September, in loamy peat. Cuttings.
- Pyramidal Chitonina. (*Chitonina pyramidalis*.) Flowers in July and August, in loamy peat. Cuttings.
- White-flowered Jamaica Rose. (*Meriana leucantha*.) Flowers from June to August, in peaty loam. Cuttings.
- White Canella. (*Canella alba*.) Flowers in April and May, in rich loam. Cuttings.
- Pinnate Swartzia. (*Swartzia pinnata*.) Flowers in June and July, in peaty loam. Cuttings.
- Halbert-leaved Clerodendrum. (*Clerodendrum hastatum*.) Flowers in June and July, in sandy loam. Cuttings.
- One-flowered Franciscea. (*Franciscea uniflora*.) Flowers from June to August, in loamy peat. Cuttings.
- Plane-leaved Begonia. (*Begonia platanifolia*.) Flowers in July and August, in rich mould. Cuttings.
- Blood-red Begonia. (*Begonia sanguinea*.) Flowers in May and June, in rich mould. Cuttings.
- Single-winged Begonia. (*Begonia monoptera*.) Flowers in June and July, in rich mould. Cuttings.
- Dr. Fisher's Begonia. (*Begonia Fisherii*.) Flowers in May and June, in rich mould. Cuttings.
- Changeable Hibiscus. (*Hibiscus mutabilis*.) Flowers from October to December, in peaty loam. Cuttings.
- Most Fragrant Galipea. (*Galipea odoratissima*.) Flowers from May to July, in loamy peat. Cuttings.
- Various-coloured Aciotis. (*Aciotis discolor*.) Flowers from July to September, in peaty loam. Cuttings.
- Three-nerved Blakea. (*Blakea trinerva*.) Flowers in June and July, in sandy peat. Layers.
- Spiny Caper Tree. (*Capparis spinosa*.) Flowers from May to August, in sandy loam. Cuttings.
- Cork-barked Gautteria. (*Gautteria suberosa*.) Flowers in July and August, in peaty loam. Cuttings.
- Cunningham's Eurycles. (*Eurycles Cunninghamii*.) Flowers in March and April, in sandy loam. Offsets.
- Bowie's Randia. (*Randia Bowieana*.) Flowers in July and August, in loamy peat. Cuttings.
- Large-flowered Elæocarpus. (*Elæocarpus grandiflorus*.) Flowers in June and July, in peaty loam. Cuttings.
- Heller's Sinningia. (*Sinningia Helleri*.) Flowers in June and July, in peaty loam. Cuttings.
- Sweet Lippia. (*Lippia dulcis*.) Flowers from June to September, in peaty loam. Division of the plant.
- August Gustavia. (*Gustavia augusta*.) Flowers in July and August, in rich mould. Cuttings.

## YELLOW.

Yellow Arrow Root. (*Maranta lutea*.) Flowers from June to August, in sandy loam. Division of the root.

Garland Hedychium. (*Hedychium coronarium*.) Flowers from June to September, in peaty loam. Division of the root.

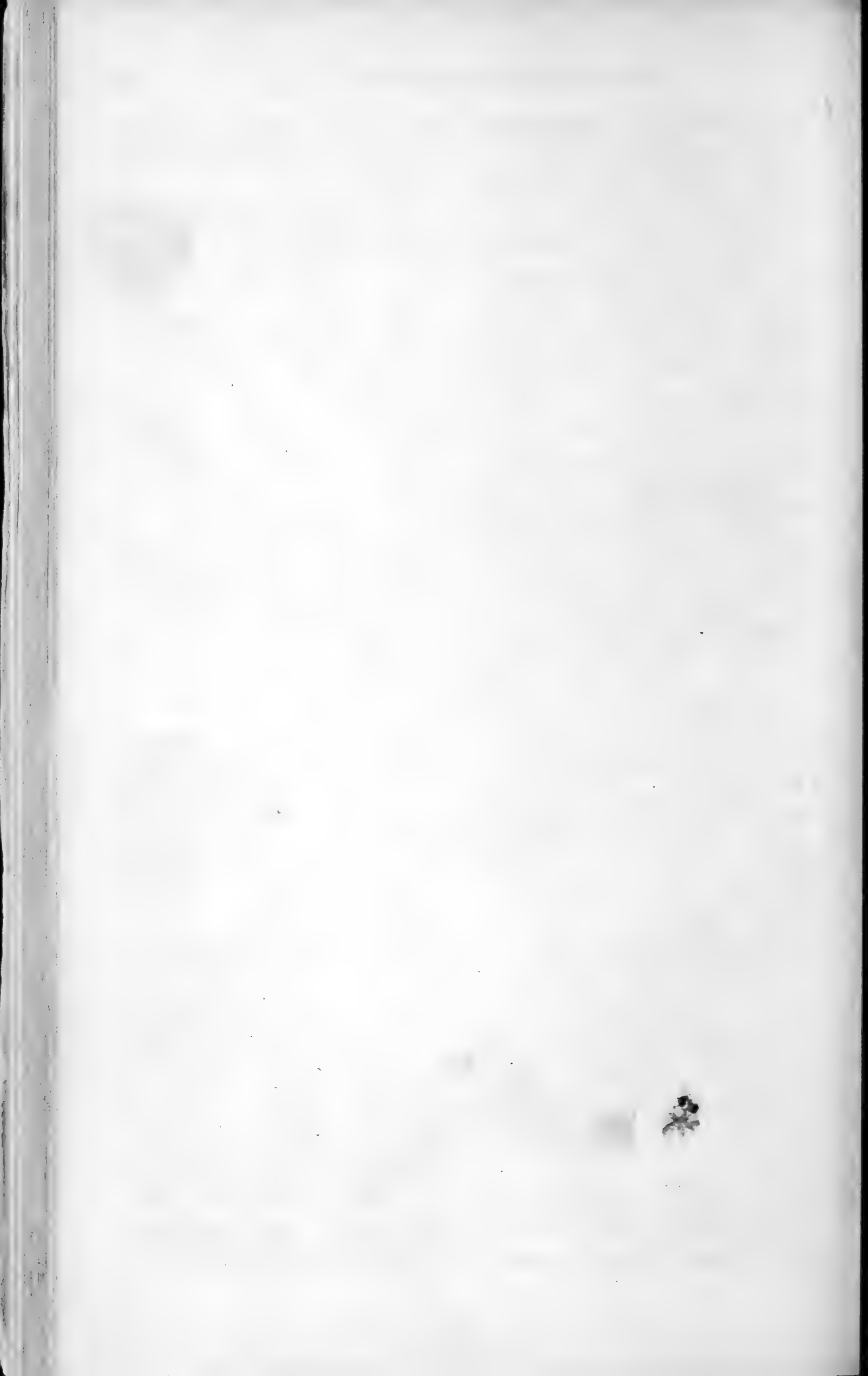
- Yellow Hedychium. (*Hedychium flavum*.) Flowers from June to August, in sandy loam. Division of the roots.
- Yellow-tufted Justicia. (*Justicia flavicoma*.) Flowers from July to September, in peaty loam. Cuttings.
- North's Marica. (*Marica Northiana*.) Flowers from April to August, in sandy peat. Division of the plant.
- Yellow Ixora. (*Ixora flava*.) Flowers from June to September, in peaty loam. Cuttings.
- Large-bellied Hamellia. (*Hamellia ventricosa*.) Flowers from September to November, in peaty loam. Cuttings.
- Sweet-scented Hamellia. (*Hamellia odorata*.) Flowers from August to September, in peaty loam. Cuttings.
- Elegant Turnera. (*Turnera elegans*.) Flowers from April to September, in sandy peat. Cuttings.
- Rock Turnera. (*Turnera rupestris*.) Flowers from June to September, in sandy peat. Seeds.
- Unarmed Mountain Ebony. (*Bauhinia inermis*.) Flowers from June to August, in peaty loam. Cuttings.
- Tall Flower Fence. (*Poinciana elata*.) Flowers in June and July, in rich mould. Seeds.
- Panicked Brasiletto. (*Cesalpinia paniculata*.) Flowers from July to September, in peaty loam. Seeds.
- Sappan Brasiletto. (*Cesalpinia Sappan*.) Flowers from June to August, in loamy peat. Cuttings.
- Flavescent Calathea. (*Calathea flavesceus*.) Flowers in July and August, in sandy loam. Division of the plant.
- Lofty Ginger. (*Zingiber elatum*.) Flowers from July to September, in sandy loam. Division of the root.
- Pendulous Globba. (*Globba pendula*.) Flowers from June to September, in sandy loam. Division of the plant.
- Racemose Globba. (*Globba racemosa*.) Flowers in June and July, in sandy loam. Division of the root.
- American Buddlea. (*Buddlea americana*.) Flowers in August, in loamy peat. Cuttings.
- Cathartic Allamanda. (*Allamanda cathartica*.) Flowers in June and July, in rich mould. Cuttings.
- Flowery Gardenia. (*Gardenia florida*.) Flowers from July to October, in loamy peat. Cuttings.
- Queen's Strelitzia. (*Strelitzia reginae*.) Flowers from April to June, in peaty loam. Suckers.
- August Strelitzia. (*Strelitzia augusta*.) Flowers from May to July, in peaty loam. Suckers.
- Sulphur-flowered Pitcairnia. (*Pitcairnia sulphurea*.) Flowers from June to August, in sandy peat. Suckers.
- Showy Cassia. (*Cassia speciosa*.) Flowers in June and July, in loamy peat. Cuttings.
- Bundle-flowered Cassia. (*Cassia floribunda*.) Flowers from July to September, in loamy peat. Cuttings.
- Twiggy Cassia. (*Cassia viminea*.) Flowers in July and August, in peaty loam. Cuttings.
- Sickle-leaved Hoffmanseggia. (*Hoffmanseggia falcaria*.) Flowers in July and August, in sandy loam. Cuttings.
- Campechy Logwood. (*Hematorylon Campechianum*.) Flowers in June and July, in rich mould. Seeds.
- Smooth-leaved Button-flower. (*Gomphia levigata*.) Flowers in July and August, in sandy loam. Cuttings.
- Ceylon Button-flower. (*Gomphia zeylanica*.) Flowers from June to August, in sandy loam. Cuttings.
- Olive Bark Tree. (*Bucida Buceras*.) Flowers from August to October, in loamy peat. Cuttings.
- Broad-leaved Bassia. (*Bassia latifolia*.) Flowers from May to July, in peaty loam. Cuttings.
- Tall Brownlowia. (*Brownlowia elata*.) Flowers from May to July, in peaty loam. Cuttings.
- Blunted Ochna. (*Ochna obtusata*.) Flowers from July to August, in loamy peat. Cuttings.
- Large-flowered Swartzia. (*Swartzia grandiflora*.) Flowers in June and July, in peaty loam. Cuttings.
- Velvety Sinningia. (*Sinningia velutina*.) Flowers from May to July, in peaty loam. Cuttings.
- Fair Crotalaria. (*Crotalaria pulchra*.) Flowers from March to May, in peaty loam. Seeds.
- Pendulous Crotalaria. (*Crotalaria pendula*.) Flowers from July to September, in sandy loam. Cuttings.
- Lotus-leaved Crotalaria. (*Crotalaria lotifolia*.) Flowers from June to August, in common mould. Seeds.
- Falcate Adenanthera. (*Adenanthera falcata*.) Flowers from May to August, in sandy loam. Cuttings.
- Spike-bearing Prosopis. (*Prosopis spicigera*.) Flowers from July to September, in rich mould. Seeds.
- Pinnate Hardwickia. (*Hardwickia pinnata*.) Flowers from June to August, in peaty loam. Cuttings.



*Succisa Repens.*

*Campanula medium.*

*Bilberia trifolia.*





Silvery Bunchosia. (*Bunchosia argentea*.) Flowers from March to May, in peaty loam. Cuttings.  
 Smooth Olibanum Tree. (*Boswellia glabra*.) Flowers from May to July, in loamy peat. Cuttings.  
 Silky Banisteria. (*Banisteria sericea*.) Flowers from June to August, in loamy peat. Cuttings.  
 Pilose Triumfetta. (*Triumfetta pilosa*.) Flowers from June to August, in loamy peat. Cuttings.  
 Large-flowered Triumfetta. (*Triumfetta grandiflora*.) Flowers from June to August, in loamy peat. Cuttings.  
 Yellow Grevia. (*Grevia flava*.) Flowers from July to September, in peaty loam. Cuttings.  
 Hairy Corchorus. (*Corchorus hirtus*.) Flowers from June to August, in peaty loam. Seeds.  
 Showy-flowered Dillenia. (*Dillenia speciosa*.) Flowers in July and August, in peaty loam. Cuttings.  
 American Brunfelsia. (*Brunfelsia americana*.) Flowers in June and July, in rich mould. Cuttings.  
 Neat Besleria. (*Besleria pulchella*.) Flowers in July and August, in loamy peat. Cuttings.

Large-leaved Besleria. (*Besleria grandiflora*.) Flowers from July to September, in loamy peat. Cuttings.  
 Erect Stylosanthes. (*Stylosanthes erecta*.) Flowers from July to September, in sandy peat. Cuttings.  
 Mucronate Stylosanthes. (*Stylosanthes mucronata*.) Flowers in July and August, in sandy peat. Cuttings.  
 Broad-leaved Cotton. (*Gossypium latifolium*.) Flowers from July to September, in sandy peat. Cuttings.  
 Cavanilles Lobelia. (*Lobelia Cavanillesiana*.) Flowers from June to August, in sandy peat. Cuttings.  
 Prickly-seeded Pavonia. (*Pavonia spinifex*.) Flowers in July and August, in sandy loam. Cuttings.  
 Five-lobed Hibiscus. (*Hibiscus quinquefolius*.) Flowers in June and July, in sandy peat. Cuttings.  
 Sweet-scented Magnolia. (*Magnolia odoratissima*.) Flowers from July to September, in peaty loam. Grafts.  
 Shining Laurel. (*Laurus splendens*.) Flowers in July and August, in loamy peat. Cuttings.

## PURPLE.

Long-bracted Calathea. (*Calathea longibracteata*.) Flowers in July and August, in sandy loam. Division of the roots.  
 Dancing Girls. (*Mantisia saltatoria*.) Flowers from June to August, in sandy loam. Division of the root.  
 Captain Sabine's Marica. (*Marica Sabini*.) Flowers in August, in peaty loam. Division of the roots.  
 Decurrent Lobelia. (*Lobelia decurrens*.) Flowers from June to September, in sandy peat. Cuttings.  
 Peach-leaved Lobelia. (*Lobelia persicifolia*.) Flowers in June and July, in sandy peat. Division of the plant.  
 Glaucous Sophora. (*Sophora glauca*.) Flowers from August to September, in sandy loam. Cuttings.  
 Purple Mountain Ebony. (*Bauhinia purpurea*.) Flowers from June to September, in loam. Cuttings.  
 Long-fruited Melastoma. (*Melastoma macrocarpa*.) Flowers from June to August, in sandy peat. Cuttings.  
 Elegant Galangale. (*Kaempferia elegans*.) Flowers from July to September, in sandy loam. Division of the plant.  
 Showy Justicia. (*Justicia speciosa*.)

Flowers in August and September, in peaty loam. Cuttings.  
 Beautiful Justicia. (*Justicia venusta*.) Flowers from September to October, in loamy peat. Cuttings.  
 Pubescent Nightshade. (*Solanum pubescens*.) Flowers from June to August, in sandy loam. Cuttings.  
 Clustered Nightshade. (*Solanum aggregatum*.) Flowers in June and July, in sandy peat. Cuttings.  
 Purple Barbacenia. (*Barbacenia purpurea*.) Flowers from July to September, in sandy loam. Division of the root.  
 Malabar Spider Wort. (*Tradescantia malabarica*.) Flowers from July to September, in rich mould. Suckers.  
 Crowded Charlwoodia. (*Charlwoodia congesta*.) Flowers from March to May, in peaty loam. Cuttings.  
 Fothergill's Chitonina. (*Chitonina Fothergillii*.) Flowers in July and August, in loamy peat. Cuttings.  
 Heteromallous Pleroma. (*Pleroma heteromalla*.) Flowers from June to September, in loamy peat. Cuttings.  
 Purple Anotta. (*Bixa purpurea*.) Flowers from June to August, in sandy peat. Seeds.

Purple Lantana. (*Lantana purpurea*.)  
Flowers from June to September, in peaty loam. Cuttings.

Upright Lantana. (*Lantana erecta*.)  
Flowers from June to August, in peaty loam. Cuttings.

Purple Lippia. (*Lippia purpurea*.)  
Flowers in June and July, in peaty loam. Cuttings.

Many-cleft Urena. (*Urena multifida*.)  
Flowers from January to October, in peaty loam. Cuttings.

Slender Chætogastra. (*Chætogastra gracilis*.) Flowers in June and July, in peaty loam. Cuttings.

Purple Jamaica Rose. (*Meriana purpurea*.) Flowers in June and July, in peaty loam. Cuttings.

Decandrous Cuphea. (*Cuphea decandra*.) Flowers from June to October, in peaty loam. Cuttings.

Slender Cuphea. (*Cuphea gracilis*.)  
Flowers in July and August, in sandy loam. Cuttings.

Showy Gloxinia. (*Gloxinia speciosa*.)  
Flowers from June to August, in sandy peat. Cuttings.

Caulicent Gloxinia. (*Gloxinia caulescens*.) Flowers from July to September, in peaty loam. Division of the plant.

Asiatic Torenia. (*Torenia asiatica*.)  
Flowers from July to September, in sandy loam. Seeds.

Diffuse Torenia. (*Torenia diffusa*.)  
Flowers from July to September, in sandy loam. Seeds.

Silver-leaved Indigo. (*Indigofera argentea*.) Flowers in July and August, in sandy peat. Cuttings.

## SCARLET.

Scarlet Hedychium. (*Hedychium coccineum*.) Flowers in July and August, in sandy loam. Division of the plant.

Shining Ixora. (*Ixora fulgens*.) Flowers from June to August, in peaty loam. Cuttings.

Strict Ixora. (*Ixora stricta*.) Flowers in July and August, in peaty loam. Cuttings.

Scarlet Justicia. (*Justicia coccinea*.)  
Flowers from March to May, in peaty loam. Cuttings.

Scarlet Manetta. (*Manetta coccinea*.)  
Flowers from May to July, in loamy peat. Cuttings.

Scarlet Portlandia. (*Portlandia coccinea*.) Flowers from June to August, in sandy peat. Cuttings.

Curassoa Swallow-wort. (*Aselepias curassavica*.) Flowers from June to September, in rich mould. Seeds.

Plaited Molineria. (*Molineria plicata*.)  
Flowers in August, in peaty loam. Division of the plant.

Bulbous Gesneria. (*Gesneria bulbosa*.)  
Flowers in May and June, in peaty loam. Division of the root.

Corymbose Gesneria. (*Gesneria corymbosa*.) Flowers from June to August, in peaty loam. Cuttings.

Scaled Clerodendrum. (*Clerodendrum squamatum*.) Flowers from June to September, in sandy peat. Cuttings.

Scarlet Brownea. (*Brownea coccinea*.)  
Flowers from July to August, in rich loam. Cuttings.

Broad-leaved Brownea. (*Brownea latifolia*.) Flowers from June to August, in sandy loam. Cuttings.

Showy Barringtonia. (*Barringtonia speciosa*.) Flowers from April to June, in rich mould. Seeds.

Broad-leaved Pitcairnia. (*Pitcairnia latifolia*.) Flowers from August to September, in sandy peat. Suckers.

Iris-flowered Pitcairnia. (*Pitcairnia iridiflora*.) Flowers from June to August, in rich mould. Suckers.

Scarlet Jamaica Rose. (*Meriana coccinea*.) Flowers in June and July, in peaty loam. Cuttings.

Long-flowered Grissomeria. (*Grissomeria longiflora*.) Flowers in July and August, in loamy peat. Cuttings.

Scarlet Lantana. (*Lantana coccinea*.)  
Flowers from June to September, in peaty loam. Cuttings.

Scarlet Trevirana. (*Trevirana coccinea*.) Flowers from August to September, in loamy peat. Division of the root.

Scarlet Pavonia. (*Pavonia coccinea*.)  
Flowers in July and August, in sandy loam. Cuttings.

Soft Malvaviscus. (*Malvaviscus mollis*.)  
Flowers from August to September, in peaty loam. Cuttings.

## RED.

Zebra Plant. (*Calathea zebrina*.)  
Flowers in June, in sandy peat. Division of the root.

Panicled Ardisia. (*Ardisia paniculata*.)  
Flowers in July and August, in sandy loam. Cuttings.

Simple Spathelia. (*Spathelia simplex*.)  
Flowers in July and August, in sandy  
peat. Seeds.

Downy Grislea. (*Grislea tomentosa*.)  
Flowers in May and June, in sandy  
peat. Cuttings.

Elongated Justicia. (*Justicia elongata*.)  
Flowers from May to July, in peaty  
loam. Cuttings.

Rosy Leadwort. (*Plumbago rosea*.)  
Flowers from March to July, in rich  
mould. Suckers.

Rosy Periwinkle. (*Vinca rosea*.)  
Flowers from March to October, in  
rich mould. Cuttings.

Stem-flowering Cynometra. (*Cyno-  
metra cauliflora*.) Flowers in June  
and July, in sandy loam and peat.  
Cuttings.

Fair Flower-fence. (*Poinciana pul-  
cherrima*.) Flowers from June to  
September, in rich mould. Cuttings.

Siliquose Corchorus. (*Corchorus sili-  
quosus*.) Flowers from June to Au-  
gust, in loamy peat. Cuttings.

Brilliant Gesneria. (*Gesneria rutila*.)  
Flowers from August to September,  
in peaty loam. Cuttings.

Many-flowered Russelia. (*Russelia  
multiflora*.) Flowers from June to  
August, in sandy peat. Cuttings.

Bundle-flowered Russelia. (*Russelia*

*floribunda*.) Flowers from June to  
August, in sandy peat. Cuttings.

Rush-leaved Russelia. (*Russelia  
juncea*.) Flowers from April to June,  
in sandy peat. Cuttings.

Mahogany Tree. (*Swietenia ma-  
hogani*.) Flowers from June to Au-  
gust, in peaty loam. Cuttings.

Shining Bunchosia. (*Bunchosia ni-  
tida*.) Flowers in July and August,  
in peaty loam. Cuttings.

Bilimbi Tree. (*Averrhoa bilimbi*.)  
Flowers from August to September,  
in sandy loam. Cuttings.

Queen's Lagerstroemia. (*Lagerstræ-  
mia regina*.) Flowers from August  
to October, in sandy loam. Cut-  
tings.

Large-flowered Lagerstroemia. (*La-  
gerstroemia grandiflora*.) Flowers  
from June to August, in sandy loam.  
Cuttings.

Netted Urena. (*Urena reticulata*.)  
Flowers in July and August, in peaty  
loam. Seeds.

Fragrant Pavonia. (*Pavonia odorata*.)  
Flowers in June and July, in sandy  
loam. Cuttings.

Chinese Rose Hibiscus. (*Hibiscus  
Rosa sinensis*.) Flowers from July  
to September, in peaty loam. Cut-  
tings.

## PINK.

Flesh-coloured Hedychium. (*Hedy-  
chium carneum*.) Flowers from June  
to August, in sandy loam. Division  
of the root.

Bracted Bromelia. (*Bromelia brac-  
teata*.) Flowers in September and  
October, in rich mould. Suckers.

Changing Rhexia. (*Rhexia versi-  
color*.) Flowers in July and Au-  
gust, in sandy peat. Cuttings.

Bloody Melastoma. (*Melastoma san-  
guinea*.) Flowers in September and  
October, in peaty loam. Cuttings.

Panicled Justicia. (*Justicia panicu-  
lata*.) Flowers from July to Sep-  
tember, in peaty loam. Seeds.

Hairy Rondeletia. (*Rondeletia hirta*.)  
Flowers from June to August, in  
sandy peat. Cuttings.

Fair Tillandsia. (*Tillandsia pulchra*.)  
Flowers from November to January,  
in rich mould. Suckers.

Aloe-leaved Tillandsia. (*Tillandsia  
aloeifolia*.) Flowers from November  
to December, in sandy peat. Suck-  
ers.

Incarnate Begonia. (*Begonia incar-  
nata*.) Flowers from August to Oc-  
tober, in peaty loam. Offsets.

Wallich's Astrapæa. (*Astrapæa Wal-  
lichii*.) Flowers in July and Au-  
gust, in sandy peat. Cuttings.

## BLUE.

Oval Galangale. (*Kæmpferia ovali-  
folia*.) Flowers in July, in sandy  
loam. Division of the root.

Margined Galangale. (*Kæmpferia  
marginata*.) Flowers in April and  
May, in sandy loam. Division of  
the root.

Pretty Eranthemum. (*Eranthemum*

*pulchellum*.) Flowers from June to  
September, in sandy peat. Cut-  
tings.

Showy Spider Wort. (*Tradescantia  
speciosa*.) Flowers in July and Au-  
gust, in rich mould. Division of the  
plant.

Slender Dichorizandra. (*Dichorizandra gracilis*.) Flowers from June to August, in rich mould. Division of the plant.

Mimose-leaved Jacaranda. (*Jacaranda mimosifolia*.) Flowers in April and May, in peaty loam. Cuttings.

Painted Ruellia. (*Ruellia picta*.) Flowers from April to August, in peaty loam. Cuttings.

Elegant Ruellia. (*Ruellia elegans*.) Flowers from June to August, in peaty loam. Cuttings.

Expelling Justicia. (*Justicia Echolium*.) Flowers from March to August, in peaty loam. Cuttings.

Lovely Justicia. (*Justicia amabilis*.)

Flowers in June and July, in loamy peat. Cuttings.

Strict Tillandsia. (*Tillandsia stricta*.) Flowers in June and July, in sandy peat. Suckers.

Slender-leaved Tillandsia. (*Tillandsia tenuifolia*.) Flowers in June and July, in sandy peat. Suckers.

Hairy Gloxinia. (*Gloxinia hirsuta*.) Flowers from June to August, in sandy peat. Division of the plant.

Many-flowered Erisma. (*Erisma florbunda*.) Flowers from September to November, in common loam. Cuttings.

Dancing Girls. (*Mantisia spathulata*.) Flowers in June and July, in sandy loam. Division of the root.

## CRIMSON.

Painted Justicia. (*Justicia picta*.) Flowers in June and July, in peaty loam. Cuttings.

Cuba Red Wood. (*Ceanothus cubensis*.) Flowers in July and August, in peaty loam. Cuttings.

## FLESH-COLOURED.

Flesh - coloured Justicia. (*Justicia carnea*.) Flowers from August to September, in loamy peat. Cuttings.

Rosy Ixora. (*Ixora rosea*.) Flowers from June to August, in peaty loam. Cuttings.

Bandhooka Ixora. (*Ixora Bandhooka*.) Flowers in July, in peaty loam. Cuttings.

Flesh-coloured Ixora. (*Ixora incarnata*.) Flowers from August to September, in peaty loam. Cuttings.

Heracleum-leaved Begonia. (*Begonia heracleifolia*.) Flowers from March to August, in rich mould. Division of the plant.

Remarkable Begonia. (*Begonia insignis*.) Flowers from December to February, in loamy peat. Cuttings.

## GREEN.

Three - coloured Guzmania. (*Guzmania tricolor*.) Flowers in May and June, in rich mould. Suckers.

Carambola Tree. (*Averrhoa carambola*.) Flowers from August to September, in sandy loam. Cuttings.

Cassia Cinnamon. (*Cinnamomum Cassia*.) Flowers from May to September, in sandy peat. Cuttings.

Camphor Tree. (*Cinnamomum Camphora*.) Flowers from March to June, in loamy peat. Cuttings.

## ORANGE.

Madagascar Buddlea. (*Buddlea madagascariensis*.) Flowers from June to August, in loamy peat. Cuttings.

Orange - flowered Jacquinia. (*Jacquinia aurantiacea*.) Flowers from April to September, in peaty loam. Cuttings.

Horrid Coulteria. (*Coulteria horrida*.) Flowers from June to August, in peaty loam. Seeds.

Great-flowered Ixora. (*Ixora grandiflora*.) Flowers from June to September, in loamy peat. Cuttings.

Saffron-coloured Ixora. (*Ixora crocata*.) Flowers from August to October, in peaty loam. Cuttings.

Wave - leaved Crossandra. (*Crossandra undulatifolia*.) Flowers in June and July, in peaty loam. Cuttings.

## VIOLET.

Long-flowered Nightshade. (*Solanum longiflorum*.) Flowers from June to August, in peaty loam. Cuttings.

Mexican Nightshade. (*Solanum mexi-*

*canum*.) Flowers in June and July, in peaty loam. Cuttings.

Violet-coloured Brunfelsia. (*Brunfelsia violacea*.) Flowers in July and August, in rich mould. Cuttings.

## VARIEGATED.

Douglass's Gesneria. (*Gesneria Douglassii*.) Flowers from September to October, in peaty loam. Cuttings.

Spotted Sinningia. (*Sinningia guttata*.) Flowers from May to July, in peaty loam. Cuttings.

## SELECT LIST OF TROPICAL CLIMBING PLANTS.

## WHITE.

Narrow-leaved Jasmine. (*Jasminum angustifolium*.) Flowers most of the year, in sandy loam. Cuttings.

Zambac Jasmine. (*Jasminum Sambac*.) Flowers half the year, in rich mould. Cuttings.

Climbing Jasmine. (*Jasminum scandens*.) Flowers in July, in common mould. Cuttings.

Three-nerved Jasmine. (*Jasminum trinerve*.) Flowers in June and July, in loam and peat. Cuttings.

Flexible Jasmine. (*Jasminum flexile*.) Flowers in April and May, in rich mould. Cuttings.

Climbing Plax. (*Plax scandens*.) Flowers nearly all the year, in loam and peat. Cuttings.

Climbing Leadwort. (*Plumbago scandens*.) Flowers in July and August, in sandy peat. Suckers.

West Indian Leadwort. (*Plumbago occidentalis*.) Flowers in April, in loamy peat. Cuttings.

Great-flowered Ipomœa. (*Ipomœa grandiflora*.) Flowers in September, in sandy loam. Suckers.

Smooth Bindweed. (*Convolvulus glaber*.) Flowers in May and June, in peat and loam. Cuttings.

Guiana Bindweed. (*Convolvulus guianensis*.) Flowers in June and August, in common mould. Cuttings.

Twining Porana. (*Porana volubilis*.) Flowers in July and August, in peat and loam. Suckers.

Panicled Dinetus. (*Dinetus paniculata*.) Flowers from August to September, in peaty loam. Cuttings.

Large-flowered Beaumontia. (*Beaumontia grandiflora*.) Flowers in July, in peaty loam. Cuttings.

Twin-flowered Echites. (*Echites biflora*.) Flowers in July, in peat and loam. Cuttings.

Long-flowered Echites. (*Echites longiflora*.) Flowers from May to August, in peat and loam. Cuttings.

Trellis Vallaris. (*Vallaris pergularis*.) Flowers most of the year, in peat and loam. Cuttings.

Shining Solandra. (*Solandra nitida*.) Flowers all the year, in loamy peat. Cuttings.

Nodding Staff Tree. (*Celastrus nutans*.) Flowers nearly all the year, in loamy peat. Cuttings.

Climbing Melodinus. (*Melodinus scandens*.) Flowers in July and August, in sandy peat. Cuttings.

Monogynous Melodinus. (*Melodinus monogynus*.) Flowers in July and August, in rich mould. Cuttings.

Emetic Secamone. (*Secamone emetica*.) Flowers in June and July, in sandy peat and loam. Cuttings.

Globose Sacrolobus. (*Sacrolobus globosus*.) Flowers in June and July, in peat and loam. Cuttings.

Twiggy Asparagus. (*Asparagus sarmmentosus*.) Flowers in August, in rich mould. Division of the root.

Decandrous Combretum. (*Combretum decandrum*.) Flowers in July, in rich mould. Cuttings.

Racemose Combretum. (*Combretum racemosum*.) Flowers in July and August, in rich mould. Cuttings.

Sinuate-leaved Seriana. (*Seriana sinuata*.) Flowers in July and August, in common mould. Cuttings.

Rusty Urvillæa. (*Urvillæa ferruginea*.) Flowers from May to July, in sandy peat. Cuttings.

Large-flowered Cardiospermum. (*Cardiospermum grandiflorum*.) Flowers in July and August, in sandy loam. Cuttings.

Climbing Mountain Ebony. (*Bauhinia scandens*.) Flowers from May to July, in light loam. Cuttings.

Showy Mountain Ebony. (*Bauhinia speciosa*.) Flowers from June to July, in light loam. Cuttings.

Clustered Gærtnera. (*Gærtnera racemosa*.) Flowers in March and April, in peat and loam. Cuttings.

Obtuse-leaved Gærtnera. (*Gærtnera obtusifolia*.) Flowers in April and May, in peat and loam. Cuttings.

Fragrant Richiea. (*Richiea fragrans*.)

Flowers in June and July, in rich mould. Cuttings.

Caripe Virgin's Bower. (*Clematis caripensis*.) Flowers from June to August, in peat and loam. Layers.

Fragrant Thunbergia. (*Thunbergia fragrans*.) Flowers most of the year, in peat and loam. Cuttings.

Twining Clerodendrum. (*Clerodendrum volubile*.) Flowers from June to July, in peat and loam. Cuttings.

Eatable Passion-flower. (*Passiflora edulis*.) Flowers in July and August, in loamy peat. Cuttings.

Hairy Passion-flower. (*Passiflora hirsuta*.) Flowers in September and October, in loamy peat. Cuttings.

Racemose Nissolia. (*Nissolia racemosa*.) Flowers from June to August, in sandy loam. Cuttings.

Cochinchinese Mieranthus. (*Mieranthus cochinchinensis*.) Flowers from June to August, in common mould. Suckers.

Net-leaved Rhynchosia. (*Rhynchosia reticulata*.) Flowers from July to September, in peaty loam. Cuttings.

Jacquin's Dolichos. (*Dolichos Jacquinii*.) Flowers in July and August, in sandy loam. Cuttings.

White-flowered Cylista. (*Cylista albiflora*.) Flowers in April and May, in peaty loam. Cuttings.

Twining Dalbergia. (*Dalbergia volubilis*.) Flowers in May and June, in sandy loam. Cuttings.

Sweet-scented Mikania. (*Mikania suaveolens*.) Flowers in August, in common mould. Cuttings.

## GREEN.

Obcordate Hypocratea. (*Hypocratea obcordata*.) Flowers in July and August, in peaty loam. Cuttings.

Obtuse-leaved Hypocratea. (*Hypocratea obtusifolia*.) Flowers in June and July, in peaty loam. Cuttings.

Climbing Tonsella. (*Tonsella scandens*.) Flowers in August, in sandy loam. Cuttings.

Climbing Messerschmidia. (*Messerschmidia scandens*.) Flowers in July and August, in peaty loam. Cuttings.

Wave-leaved Cynanchum. (*Cynanchum undatum*.) Flowers in July and August, in loamy peat. Cuttings.

Sharp-pointed Cynanchum. (*Cynanchum mucronatum*.) Flowers in July

and August, in loamy peat. Cuttings.

Green-flowered Cynanchum. (*Cynanchum viridiflorum*.) Flowers in October, in loamy peat. Cuttings.

Small-flowered Metastelma. (*Metastelma parviflorum*.) Flowers in July and August, in peaty loam. Cuttings.

Wood Gymnema. (*Gymnema sylvestre*.) Flowers in July and August, in loamy peat. Cuttings.

Keeled Sacrolobus. (*Sacrolobus carinatus*.) Flowers in June and July, in peaty loam. Cuttings.

Sea-shore Gonolobus. (*Gonolobus maritimus*.) Flowers in June and July, in peaty loam. Cuttings.

Cork-barked Gonolobus. (*Gonolobus suberosus*.) Flowers in July and August, in peaty loam. Cuttings.  
 Large-flowered Gonolobus. (*Gonolobus grandiflorus*.) Flowers in July and August, in peaty loam. Cuttings.  
 Bmetic Diplolepis. (*Diplolepis vomitoria*.) Flowers in June and July, in peaty loam. Cuttings.  
 Ovate Diplolepis. (*Diplolepis ovata*.) Flowers in June and July, in peaty loam. Cuttings.  
 Sweet-scented Pergularia. (*Pergularia odoratissima*.) Flowers in June and July, in rich mould. Cuttings.  
 Bloody Pergularia. (*Pergularia sanguinolenta*.) Flowers in July and August, in rich mould. Cuttings.  
 Diceious Virgin's Bower. (*Clematis dioica*.) Flowers in May and June, in sandy peat. Layers.  
 Twining Tragia. (*Tragia volubilis*.) Flowers in June and July, in common mould. Cuttings.  
 Pedunculed Tragia. (*Tragia pedunculata*.) Flowers in June and July, in common mould. Cuttings.  
 Climbing Phyllanthus. (*Phyllanthus scandens*.) Flowers from July to

September, in sandy peat. Cuttings.  
 Climbing Dalechampia. (*Dalechampia scandens*.) Flowers in June and July, in loamy peat. Cuttings.  
 Twining Plunkenetia. (*Plunkenetia volubilis*.) Flowers in July and August, in peaty loam. Cuttings.  
 Lobed-leaved Modecca. (*Modecca lobata*.) Flowers in August, in rich mould. Cuttings.  
 Long-leaved Smilax. (*Smilax longifolia*.) Flowers in May and June, in peaty loam. Cuttings.  
 Cordate-leaved Rajania. (*Rajania cordata*.) Flowers in July, in peaty loam. Division of the root.  
 Villos Cocculus. (*Cocculus villosus*.) Flowers from May to June, in loamy peat. Division of the root.  
 Distilling Chinese Pitcher Plant. (*Nepenthes distillatoria*.) Flowers from April to May, in peaty loam. Cuttings.  
 Heart-leaved Gouania. (*Gouania cordifolia*.) Flowers from May to July, in peaty loam. Cuttings.  
 St. Domingo Gouania. (*Gouania domingensis*.) Flowers from May to July, in peaty loam. Cuttings.

## YELLOW.

Yellow Bindweed. (*Convolvulus ochraceus*.) Flowers in July and August, in peaty loam. Cuttings.  
 Suberect Echites. (*Echites suberecta*.) Flowers from June to August, in peaty loam. Cuttings.  
 Red-stemmed Echites. (*Echites rubricaulis*.) Flowers from July to August, in peaty loam. Cuttings.  
 Red-veined Hæmadictyon. (*Hæmadictyon venosum*.) Flowers in July and August, in peaty loam. Cuttings.  
 Great-flowered Solandra. (*Solandra grandiflora*.) Flowers from March to May, in rich mould. Cuttings.  
 Esculent Oxystelma. (*Oxystelma esculentum*.) Flowers in May and June, in sandy loam. Division of the root.  
 Tinging Gymnema. (*Gymnema tingens*.) Flowers in July, in peaty loam. Cuttings.  
 Most tenacious Gymnema. (*Gymnema tenacissimum*.) Flowers in July and August, in peaty loam. Cuttings.  
 Scandent Brasiletto. (*Cesalpinia scandens*.) Flowers in July and August, in peaty loam. Seeds.  
 Shining Banisteria. (*Banisteria splen-*

*dens*.) Flowers in July and August, in sandy loam. Cuttings.  
 Shining-fruited Banisteria. (*Banisteria fulgens*.) Flowers in July and August, in rich mould. Cuttings.  
 Golden-leaved Heteropteris. (*Heteropteris chrysophylla*.) Flowers in June and July, in rich mould. Cuttings.  
 Jamaica Triopteris. (*Triopteris jamaicensis*.) Flowers in May and June, in peaty loam. Cuttings.  
 Reclined Hirvæa. (*Hirvæa reclinata*.) Flowers in June and July, in sandy loam. Cuttings.  
 Twining Tetracera. (*Tetracera volubilis*.) Flowers in June and July, in peaty loam. Cuttings.  
 Large-flowered Virgin's Bower. (*Clematis grandiflora*.) Flowers in May and June, in peaty loam. Layers.  
 Ceylon Naravelia. (*Naravelia zeylanica*.) Flowers in July and August, in sandy peat. Layers.  
 Large-leaved Trumpet-flower. (*Bignonia grandifolia*.) Flowers from April to June, in peaty loam. Cuttings.  
 Winged Thunbergia. (*Thunbergia alata*.) Flowers from May to September, in peaty loam. Cuttings.

Hooked Spathodea. (*Spathodea uncata*.) Flowers in September and October, in sandy peat. Cuttings.  
 Violet-berried Besleria. (*Besleria violacea*.) Flowers in July and August, in loamy peat. Cuttings.  
 Climbing Pterocarpus. (*Pterocarpus scandens*.) Flowers in June and July, in sandy loam. Cuttings.  
 St. Vincent's Chaetocalyx. (*Chaetocalyx Vincentina*.) Flowers from May to August, in peaty loam. Cuttings.  
 Caribbean Rhynchosia. (*Rhynchosia caribaea*.) Flowers from September to October, in peaty loam. Cuttings.  
 Clammy Fagelia. (*Fagelia bituminosa*.) Flowers from April to September, in loamy peat. Cuttings.  
 Yellow-flowered Dolichos. (*Dolichos luteus*.) Flowers in July and August, in sandy loam. Seeds.  
 Soft Dioclea. (*Dioclea mollis*.) Flowers

in July and August, in sandy loam. Division of the plant.  
 Pedate Anguria. (*Anguria pedata*.) Flowers in June and July, in loamy peat. Division of the root.  
 Shady Anguria. (*Anguria umbrosa*.) Flowers in June and July, in loamy peat. Division of the root.  
 Dicecious Momordica. (*Momordica dioica*.) Flowers in July and August, in common mould. Seeds.  
 Tube-flowered Momordica. (*Momordica tubiflora*.) Flowers in July and August, in common mould. Seeds.  
 Racemose Tiliacora. (*Tiliacora racemosa*.) Flowers in June and July, in rich mould. Division of the root.  
 Pitcher-leaved Pitcher-plant. (*Nepenthes phyllamphora*.) Flowers in June and August, in peaty loam. Cuttings.  
 Calinea Doliocarpus. (*Doliocarpus Calinea*.) Flowers in June and July, in loamy peat. Cuttings.

## ORANGE.

Scandent Jonesia. (*Jonesia scandens*.) Flowers in April and May, in peaty loam. Cuttings.  
 Mealy Combretum. (*Combretum farinosum*.) Flowers from April to July, in rich mould. Cuttings.  
 Indian Quisqualis. (*Quisqualis indica*.) Flowers from May to August, in loamy peat. Cuttings.

Pubescent Quisqualis. (*Quisqualis pubescens*.) Flowers from May to August, in loamy peat. Cuttings.  
 Lovely Trumpet-flower. (*Bignonia venusta*.) Flowers in September and October, in loamy peat. Cuttings.  
 Jasmine-leaved Trumpet-flower. (*Bignonia jasminifolia*.) Flowers in June and July, in loamy peat. Cuttings.

## PURPLE.

Showy Ipomœa. (*Ipomœa speciosa*.) Flowers in July and August, in peaty loam. Seeds.  
 Long-flowered Ipomœa. (*Ipomœa longiflora*.) Flowers in July and August, in peaty loam. Division of the root.  
 Panicked Amphilobium. (*Amphilobium paniculatum*.) Flowers in June and July, in loamy peat. Cuttings.  
 Comose Combretum. (*Combretum comosum*.) Flowers from June to December, in rich mould. Cuttings.  
 Bundle-flowered Trumpet-flower. (*Bignonia floribunda*.) Flowers in April and June, in loamy peat. Cuttings.  
 Twisting Petrea. (*Petrea volubilis*.) Flowers in July and August, in rich mould. Cuttings.  
 Obtuse-leaved Canavalia. (*Canavalia obtusifolia*.) Flowers in July and August, in sandy loam. Cuttings.  
 Prayer Wild Liquorice. (*Abrus precatorius*.) Flowers from March to May, in sandy peat. Seeds.  
 Long-leaved Sweetia. (*Sweetia longi-*

*folia*.) Flowers in July and August, in sandy peat. Cuttings.  
 Woody Sweetia. (*Sweetia lignosa*.) Flowers in July and August, in sandy peat. Cuttings.  
 Ovate Amphodus. (*Amphodus ovatus*.) Flowers in July and August, in sandy peat. Cuttings.  
 Purple Lablab. (*Lablab purpureus*.) Flowers from August to September, in sandy loam. Seeds.  
 Angled Pachyrhizus. (*Pachyrhizus angulatus*.) Flowers in July and August, in sandy loam. Cuttings.  
 Three-lobed Birthwort. (*Aristolochia lobata*.) Flowers in June and July, in peaty loam. Cuttings.  
 Sweet-scented Birthwort. (*Aristolochia odoratissima*.) Flowers in July and August, in peaty loam. Cuttings.  
 African Jollifia. (*Jollifia africana*.) Flowers in July and August, in peaty loam. Cuttings.  
 Elegant Ceropegia. (*Ceropegia elegans*.) Flowers in August and September, in loamy peat. Cuttings.



## SCARLET.

Cut-leaved Ipomœa. (*Ipomœa dissecta*.) Flowers in June and July, in sandy peat. Cuttings.

Purple Combretum. (*Combretum purpureum*.) Flowers from June to December, in rich mould. Cuttings.

Climbing Columnnea. (*Columnnea scan-*

*dens*.) Flowers from August to October, in sandy peat. Cuttings.

Scarlet Thunbergia. (*Thunbergia coccinea*.) Flowers from May to September, in peaty loam. Cuttings.

Climbing Holmskioldia. (*Holmskioldia scandens*.) Flowers from April to December, in peaty loam. Cuttings.

## RED.

Involucrate Ipomœa. (*Ipomœa involu-crata*.) Flowers in July and August, in sandy loam. Seeds.

Roxburgh's Ipomœa. (*Ipomœa Rox-burghii*.) Flowers from June to August, in peaty loam. Cuttings.

Climbing Dalbergia. (*Dalbergia scan-dens*.) Flowers from April to June, in sandy loam. Cuttings.

Twining Teramnus. (*Teramnus volu-bilis*.) Flowers in July and August, in rich mould. Cuttings.

Pendulous Galactia. (*Galactia pen-dula*.) Flowers in July and August, in loamy peat. Cuttings.

Ceylon Uvaria. (*Uvaria zeylanica*.) Flowers in June and July, in peaty loam. Cuttings.

## PINK.

Seaforth's Nightshade. (*Solanum Sea-forthianum*.) Flowers from July to September, in loamy peat. Cuttings.

Ciliated Bindweed. (*Convolvulus cilia-tus*.) Flowers from July to September, in sandy loam. Seeds.

Greatest Ceylon Bindweed. (*Convol-*

*vulus maximus*.) Flowers in July and August, in rich mould. Division of the root.

Large-flowered Cryptostegia. (*Cry-ptostegia grandiflora*.) Flowers in June and July, in rich mould. Cuttings.

## BLUE.

Twining Nightshade. (*Solanum volu-bilis*.) Flowers in June and July, in peaty loam. Cuttings.

Blue-flowering Heteropteris. (*Hete-ropteris cœrulea*.) Flowers in July and August, in peaty loam. Cuttings.

Large-flowered Thunbergia. (*Thun-bergia grandiflora*.) Flowers from

May to September, in peaty loam. Cuttings.

Five-flowered Bindweed. (*Convolvulus pentanthus*.) Flowers from July to September, in sandy loam. Cuttings.

Verticillate Bindweed. (*Convolvulus verticillatus*.) Flowers from July to September, in rich mould. Seeds.

## BROWN.

Mauritian Periploca. (*Periploca mau-ritiana*.) Flowers in July and August, in peaty loam. Cuttings.

Narum Unona. (*Unona Narum*.) Flowers in May and June, in peaty loam. Cuttings.

## THE DRY STOVE.

AUTHORS in general have considered the Dry Stove as a receptacle for such plants as require an intermediate temperature between the greenhouse and moist stove. Our view of the subject is quite different; we presume the Dry Stove to be a house in which such plants are to be grown as require an equally high temperature, but which are impatient of that degree of humidity necessary in the moist stove. For example, we may state some of the more tender *Euphorbias*, *Blakea*, *Echites*, *Roxburghia*, *Malpighia*, *Theophrasta*, *Myrtus*, *Dillenia*, *Caryophyllus*, *Atrocarpus*, *Jacquinia*, *Plumieria*, *Jatropha*, and *Theobroma*. The Dry Stove has also been considered by many as a house in which the culture of succulent plants only may be carried on. Modern discovery has sufficiently proved that the majority of succulent plants prosper better in a temperature much below that of stoves in general, and we think that we have pretty clearly demonstrated, in a former part of these pages, the utility of growing that singular and interesting tribe of plants by themselves, in a much lower temperature than has hitherto been recommended. As an instance of former practice in this respect we may quote that in use in Kew garden, where the *Agave americana* and similar plants are subjected to the unnecessary heat of what is called the Dry Stove, along with some others which might peradventure in favourable situations exist almost in the open air.

In all extensive collections of plants two separate stoves are absolutely necessary, exclusive of the Orchideæ House; the one to contain the more delicate species, and such as require the highest temperature, the other to contain such as are less delicate, and those also that require abundance of moisture. Such, therefore, we denominate the Dry and Humid Stoves. There is no doubt but palms, aquatics, and tropical fruits could be cultivated in one or other of these, but they would be cultivated much better in houses expressly set apart for them, and present a much more imposing effect.

Another important advantage arises from an arrangement of this sort, namely, that of inducing cultivators to aim at perfection in the cultivation of certain tribes, which they would arrive at by directing their attention to selections, and not attempting the formation of collections, as is too often the case. There are few lovers of plants but have a partiality for some tribes or genera more than for others, and upon these they lavish all their care and attention, while others less in their estimation are very much neglected. How much better, therefore, would it be to direct their attention to some one or two sections most agreeable to them, and to cultivate them well, rather than attempt the cultivation of a general collection, which never can be satisfactorily accomplished in one or two houses.

#### CONSTRUCTION OF THE DRY STOVE.

In construction, the Dry Stove need not be different from the Humid Stove, *which see*. It is in the method of culture that the difference exists, and that, as we have already observed, consists principally in a more scanty supply of water, the plants not requiring so much, being for the most part of slow growth. There is also another point in which they differ: while the plants in the moist stove stand on a floor of gravel, coal-ashes, or similar dry materials, the majority of Dry Stove plants require to be plunged in a bed of tan, leaves, or other fermentable matter, or in a bed of scoriæ, heated from beneath by means of steam or hot-water pipes. Plants of the former description grow very rapidly, and if placed in a bed of tan, &c., would soon grow beyond all reasonable bounds, from the increased excitement at their roots; besides, the quantity of water necessary to be syringed over them daily would soon rot the materials into which they are plunged.

Plants of the latter description, being delicate growers, require the stimulating power of a mild bottom heat, and the quantity of water necessary for them has little effect on the bed into which they are plunged. All Dry Stove plants however, do not require to be plunged in a bottom heat, at least during the periods when they are in a dormant state; shelves should be arranged against the back wall for their reception during these periods, and the trellised platform over the front flues should be set apart for small plants, and such as are in a state or of a description not to require such stimulus.

In establishments where a separate succulent house is not deemed necessary, the Dry Stove is then the proper habitation for such plants as

*Euphorbia*, *Stapelia*, and *Cactæa*, but certainly not for *Crassula* and *Aloe*. These, however, should upon no consideration be plunged into a bottom heat, but should occupy shelves or other situations where they may be kept dry at the root, and be fully exposed to the sun and air.

The mode of heating the Dry Stove does not differ from that of other plant-houses, only as a higher temperature is required, provision must be made by increasing the number of flues, steam or hot-water pipes, as has been noticed in the Moist or Humid Stove. For the purpose of producing a mild bottom heat for the plants to be placed on, a much better, neater, and less expensive method, instead of filling the pit with fermentable material, such as tan, leaves, or dung, would be to leave it an open vault, covered over at top with twelve-inch tiles, laid on iron bearers: on these tiles some fine river-sand might be placed in which to plunge the pots, or to set them on. The necessary heat would be obtained by carrying hot water or steam pipes through it so as to heat the chamber, which would give it out through the tiles on the top to the plants in an uniform and sufficient quantity; or the chamber or vault might be intersected with brick flues, through which the pipes should run, or even be filled entirely with brick-bats, or soft porous stones, as already recommended in the early part of this work: these would absorb the heat, and give it out gradually, even long after the steam or hot water had ceased to circulate amongst them. Small tubes might be introduced through the tiles or bed of sand, to admit copious supplies of steam into the body of the house when required.

The directions for propagation, already so fully entered into in the Moist Stove, are in most cases applicable to this also.

## SELECT LIST OF DRY STOVE PLANTS.

## WHITE.

- Three-nerved Blakea. (*Blakea trinervia*.) Flowers in June and July, in sandy peat. Layers.
- Five-nerved Blakea. (*Blakea quinquenervia*.) Flowers in June and July, in sandy peat. Cuttings.
- Crenulate Limonia. (*Limonia crenulata*.) Flowers in June and July, in rich mould. Cuttings.
- Orange-leaved Limonia. (*Limonia citrifolia*.) Flowers in June and July, rich mould. Cuttings.
- Showy Oxyanthus. (*Oxyanthus speciosus*.) Flowers in July, in peaty loam. Cuttings.
- Long-flowered Randia. (*Randia longiflora*.) Flowers from August to September, in loamy peat. Cuttings.
- Chinese Randia. (*Randia sinensis*.) Flowers from June to August, in loamy peat. Cuttings.
- Round-leaved Randia. (*Randia rotundifolia*.) Flowers from June to August, in loamy peat. Cuttings.
- Many-flowered Exostemma. (*Exostemma floribundum*.) Flowers in June and July, in loamy peat. Cuttings.
- Long-flowered Exostemma. (*Exostemma longiflorum*.) Flowers in June and July, in peaty loam. Cuttings.
- Jussiaeus's Theophrasta. (*Theophrasta Jussiei*.) Flowers in June and July, in rich mould. Seeds.
- Long-leaved Theophrasta. (*Theophrasta longifolia*.) Flowers in May and June, in rich mould. Cuttings.
- Bracelet Jacquinia. (*Jacquinia armillaris*.) Flowers in June and July, in peaty loam. Cuttings.
- Lambert's Plumieria. (*Plumieria Lambertiana*.) Flowers in July and August, in rich mould. Cuttings.
- Jamaica Andromeda. (*Andromeda jamaicensis*.) Flowers from May to September, in sandy peat. Layers.
- Bundled Andromeda. (*Andromeda fasciculata*.) Flowers in April and May, in sandy peat. Cuttings.
- Exotic Murraya. (*Murraya exotica*.) Flowers from August to September, in rich mould. Cuttings.
- Panicled Murraya. (*Murraya paniculata*.) Flowers in June and July, in rich mould. Cuttings.
- True Cinnamon. (*Cinnamomum verum*.) Flowers from June to September, in sandy peat. Cuttings.
- Sweet Cinnamon. (*Cinnamomum dulce*.) Flowers from March to June, in loamy peat. Cuttings.
- Fragrant Gardenia. (*Gardenia fragrans*.) Flowers in June and July, in loamy peat. Cuttings.
- Shining Gardenia. (*Gardenia lucida*.) Flowers from June to August, in loamy peat. Cuttings.
- Pubescent Gardenia. (*Gardenia pubescens*.) Flowers in June and July, in loamy peat. Cuttings.
- White Plumieria. (*Plumieria alba*.) Flowers in July and August, in rich mould. Cuttings.
- White-flowered Plumieria. (*Plumieria leucantha*.) Flowers in July and August, in rich mould. Cuttings.
- Long-leaved Plumieria. (*Plumieria longifolia*.) Flowers in July and August, in rich mould. Cuttings.
- Milky Cerbera. (*Cerbera lactaria*.) Flowers from June to September, in rich mould. Cuttings.
- Small-leaved Plumieria. (*Plumieria parvifolia*.) Flowers in July and August, in rich mould. Cuttings.
- Esculent Premna. (*Premna esculenta*.) Flowers in April and May, in sandy loam. Cuttings.

- Plumier's Talauma. (*Talauma Plumieri*.) Flowers in April and May, in peat and loam. Layers.
- Grateful - scented Tabernæmontana. (*Tabernæmontana gratissima*.) Flowers from May to September, in peat and loam. Cuttings.
- Dense - flowered Tabernæmontana. (*Tabernæmontana densiflora*.) Flowers in June, in peat and loam. Cuttings.
- Long-leaved Anthocleista. (*Anthocleista macrophylla*.) Flowers in June and July, in peat and loam. Cuttings.
- White Screw Pine. (*Pandanus albus*.) Rich mould. Seeds.
- Eatable Screw Pine. (*Pandanus edulis*.) Rich mould. Seeds.
- Dwarf Screw Pine. (*Pandanus humilis*.) Rich mould. Seeds.
- Catappan Terminalia. (*Terminalia catappa*.) Flowers in June and July, in peaty loam. Cuttings.
- Molucca Terminalia. (*Terminalia moluccana*.) Flowers from June to August, in peaty loam. Cuttings.
- True Bread Fruit. (*Artocarpus incisa*.) Flowers in June and July, in rich mould. Cuttings.
- Jaca Tree. (*Artocarpus integrifolia*.) Flowers in June and July, in rich mould. Cuttings.
- White Caroline. (*Carolinea alba*.) Flowers in July and August, in peaty loam. Cuttings.
- Common Allspice. (*Pimenta vulgaris*.) Flowers from May to July, in sandy peat. Cuttings.
- White Canella. (*Canella alba*.) Flowers in June and July, in rich loam. Cuttings.
- Laurel-leaved Canella. (*Canella laurifolia*.) Flowers from July to September, in sandy loam. Cuttings.
- Most-fragrant Galipea. (*Galipea odoratissima*.) Flowers in May, in loam and peat. Cuttings.
- Great-flowered Tabernæmontana. (*Tabernæmontana grandiflora*.) Flowers in May and June, in rich mould. Cuttings.
- Curled Tabernæmontana. (*Tabernæmontana crispa*.) Flowers from May to October, in rich mould. Cuttings.
- Sounding Sand Box-Tree. (*Hura strepens*.) Flowers in June and July, in loamy peat. Cuttings.
- Rattling Sand Box Tree. (*Hura crepitans*.) Flowers in June and July, in peaty loam. Seeds.
- Shining Croton. (*Croton nitens*.) Flowers in July and August, in peaty loam. Cuttings.
- Aromatic Croton. (*Croton aromatica*.) Flowers in July and August, in peaty loam. Cuttings.
- Snow-white Croton. (*Croton nivea*.) Flowers in July and August, in peaty loam. Cuttings.
- Sour Gourd. (*Adansonia digitata*.) Flowers in July and August, in peaty loam. Cuttings.
- Canescent Pterospermum. (*Pterospermum canescens*.) Flowers in July and August, in peaty loam. Cuttings.
- Cork-tree leaved Pterospermum. (*Pterospermum suberifolium*.) Flowers from September to October, in peaty loam. Cuttings.
- Umbelled Echites. (*Echites umbellata*.) Flowers in June and July, in peaty loam. Cuttings.
- Acrid Wild Clove. (*Myrtus acris*.) Flowers from May to July, in sandy peat. Cutting.
- Allspice-like Myrtle. (*Myrtus pimentoides*.) Flowers from March to May, in sandy peat. Cutting.
- Bushy Myrtle. (*Myrtus dumosa*.) Flowers in June and July, in sandy peat. Cuttings.

## PURPLE.

- Glaucous Camphor Tree. (*Cinnamomum glaucum*.) Flowers in March and June, in loamy peat. Cuttings.
- Twiggy Cuphea. (*Cuphea virgata*.) Flowers from August to September, in sandy loam. Seeds.
- Slender Cuphea. (*Cuphea gracilis*.) Flowers in July and August, in sandy loam. Cuttings.
- Racemose Cuphea. (*Cuphearacemosa*.) Flowers in June and July, in sandy loam. Cuttings.
- Lindley's Hibiscus. (*Hibiscus Lindlei*.) Flowers in December, in peat and loam. Cuttings.
- Glaucous-leaved Lisianthus. (*Lisianthus glaucifolius*.) Flowers in June and July, in loamy peat. Cuttings.
- Hairy Columnea. (*Columnea hirsuta*.) Flowers from August to November, in sandy peat. Cuttings.
- Red - leaved Columnea. (*Columnea rutilans*.) Flowers from August to September, in sandy peat. Cuttings.
- Wedge-leaved Silverweed. (*Argyrea cuneata*.) Flowers in August and September, in sandy loam. Cuttings.

## PINK.

Pendulous Laurel. (*Laurus pendula*.)  
Flowers in April and May, in loamy  
peat. Cuttings.

Tanquin Cerbera. (*Cerbera Tanquin*.)  
Flowers in March and May, in rich  
mould. Cuttings.

Large-flowered Echitis. (*Echitis gran-  
diflora*.) Flowers in June and July,  
in peaty loam. Cuttings.

Apple-fruited Silverweed. (*Argyrea  
pomacea*.) Flowers in June and July,  
in rich mould. Cuttings.

Glossy Barbadoes Cherry. (*Malpighia  
nitida*.) Flowers from March to Au-  
gust, in peaty loam. Cuttings.

Berry-bearing Barbadoes Cherry.  
(*Malpighia coccifera*.) Flowers from  
August to September, in peaty loam.  
Cuttings.

Pleasing Gardenia. (*Gardenia amœna*.)  
Flowers from June to August, in  
rich mould. Cuttings.

Gloriosa-like Roxburghia. (*Roxbur-  
ghia gloriosoides*.) Flowers in April  
and May, in peaty loam. Suckers.

Showy Urena. (*Urena speciosa*.) Flow-  
ers in November, in sandy loam.  
Seeds.

## SCARLET.

Buffalo Burchellia. (*Burchellia buba-  
lina*.) Flowers in May and June, in  
loamy peat. Cuttings.

Leathery Ardisia. (*Ardisia coriacea*.)  
Flowers in July and August, in sandy  
loam. Cuttings.

Scarlet Physic Nut. (*Jatropha cocci-  
nea*.) Flowers from May to August,  
in peaty loam. Cuttings.

Fiddle-leaved Physic Nut. (*Jatropha*

*panduræfolia*.) Flowers in May and  
August, in rich mould. Seeds.

Climbing Columnea. (*Columnea scan-  
dens*.) Flowers from August to Sep-  
tember, in sandy peat. Cuttings.

Shining Euphorbia. (*Euphorbia splen-  
dens*.) Flowers from June to Sep-  
tember, in sandy loam. Cuttings.

Melville's Cuphea. (*Cuphea Melville*.)  
Flowers from August to September,  
in peaty loam. Cuttings.

## ORANGE.

Orange-flowered Jacquinia. (*Jacqui-  
nia aurantiaca*.) Flowers from April  
to September, in peaty loam. Cut-  
tings.

Long-fruited Jacquinia. (*Jacquinia*

*macrocarpa*.) Flowers from May to  
September, in peaty loam. Cuttings.

Waved Tabernamontana. (*Taberna-  
montana undulata*.) Flowers from  
May to September, in rich mould.  
Cuttings.

## BROWN.

Two-coloured Chocolate Nut. (*Theo-  
broma bicolor*.) Flowers in June and  
July, in rich mould. Cuttings.

Common Cacao. (*Theobroma cacao*.)  
Flowers from September to October,  
in rich mould. Cuttings.

Guiana Chocolate-nut. (*Theobroma  
guianensis*.) Flowers in June and  
July, in rich mould. Cuttings.

Medicinal Sterculia. (*Sterculia fraga-  
cantha*.) Flowers in May, in loam  
and peat. Cuttings.

## BLUE.

Three-leaved Columna. (*Columna tri-  
foliata*.) Flowers from August to  
November, in sandy peat. Cuttings.

Carolina Jacaranda. (*Jacaranda Caro-  
liniana*.) Flowers in July and Au-  
gust, in peat and loam. Cuttings.

Oval-leaved Jacaranda. (*Jacaranda  
ovalifolia*.) Flowers in April and  
May, in peat and loam. Cuttings.

Painted Ruelia. (*Ruelia picta*.) Flow-  
ers from April to August, in peat and  
loam. Cuttings.

## RIPED.

Decandolle's Taluma. (*Talmuna Candollii*.) Flowers in April and May, in peat and loam. Layers.

## ROSE.

Splendid Hibiscus. (*Hibiscus splendens*.) Flowers in May, in rich mould. Cuttings.

## YELLOW.

Tall Flower Fence. (*Poinciana elata*.) Flowers in June and July, in rich mould. Seeds.

Shining Laurel. (*Laurus splendens*.) Flowers from March to June, in loamy peat. Cuttings.

Bundle-flowered Laurel. (*Laurus floribunda*.) Flowers from June to August, in loamy peat. Cuttings.

Broad-leaved Lisianthus. (*Lisianthus latifolius*.) Flowers from July to September, in loamy peat. Seeds.

Heart-leaved Lisianthus. (*Lisianthus cordifolius*.) Flowers in July and August, in loamy peat. Cuttings.

Forked Strophanthus. (*Strophanthus dichotomus*.) Flowers from February to March, in rich mould. Cuttings.

Thevetia Cerbera. (*Cerbera Thevetia*.) Flowers in June and July, in rich mould. Cuttings.

Tall Terminalia. (*Terminalia procera*.) Flowers in June and July, in peaty loam. Cuttings.

Showy Dillenia. (*Dillenia speciosa*.) Flowers from June to August, in peaty loam. Cuttings.

Aromatic Clove Tree. (*Caryophyllus aromaticus*.) Flowers in May and June, in loamy peat. Cuttings.

Herbert's Cassia. (*Cassia Herbertiana*.) Flowers in November, in loam and peat. Seeds.

Short-leaved Cassia. (*Cassia brevifolia*.) Flowers in June and July, in sandy loam. Seeds.

Long-haired Hibiscus. (*Hibiscus crinitus*.) Flowers in September and October, in peat and loam. Seeds.

MacLeay's Hibiscus. (*Hibiscus Macleayanus*.) Flowers in August and September, in loam and peat. Cuttings.

Doubtful Barbadoes Cherry. (*Malpighia dubia*.) Flowers in July and August, in peaty loam. Cuttings.

Slender Cinnamon. (*Cinnamomum gracile*.) Flowers from March to June, in sandy peat. Cuttings.

Broad-leaved Gardenia. (*Gardenia latifolia*.) Flowers from June to July, in loamy peat. Cuttings.

Yellow Plumieria. (*Plumieria lutea*.) Flowers in July and August, in rich mould. Cuttings.

Chaste-flowered Plumieria. (*Plumieria pudica*.) Flowers in June and July, in rich mould. Cuttings.

Sweet-scented Tabernæmontana. (*Tabernæmontana fragrans*.) Flowers from October to November, in rich mould. Cuttings.

Slender Brucea. (*Brucea gracilis*.) Flowers in April and May, in peaty loam. Cuttings.

Corymbose Pavonia. (*Pavonia corymbosa*.) Flowers in July and August, in sandy loam. Seeds.

Broad-leaved Lily Thorn. (*Catesbæa latifolia*.) Flowers in June and July, in peaty loam. Cuttings.

Spinous Lily Thorn. (*Catesbæa spinosa*.) Flowers from May to September, in sandy peat. Cuttings.

Suberect Echites. (*Echites suberecta*.) Flowers from June to August, in peaty loam. Cuttings.

Twisted Echites. (*Echites torosa*.) Flowers from June to August, in peaty loam. Cuttings.

Fringed Carulluma. (*Carulluma fibrata*.) Flowers in July and August, in sandy loam. Cuttings.

Crenulated Canelluma. (*Canelluma crenulata*.) Flowers in July and August, in sandy loam. Cuttings.

## GREEN.

Cogwood-tree Laurel. (*Laurus Chlo-roxylon*.) Flowers in June and July, in loamy peat. Cuttings.

Shining Cinnamon. (*Cinnamomum nitidum*.) Flowers from September to October, in peaty loam. Cuttings.



Camphor Tree. (*Cinnamomum camphora*.) Flowers from June to August, in loamy peat. Cuttings.

Rusty Brucea. (*Brucea ferruginea*.) Flowers in April and May, in peaty loam. Cuttings.

Sumatra Brucea. (*Brucea sumatrana*.)

Flowers in April and May, in peaty loam. Cuttings.

Multifid Physic Nut. (*Jatropha multifida*.) Flowers in June and July, in rich mould. Cuttings.

Curcas Physic Nut. (*Jatropha Curcas*.) Flowers from May to August, in peaty loam. Cuttings.

## RED.

Painted Barbadoes Cherry. (*Malpighia fucata*.) Flowers from March to August, in peaty loam. Cuttings.

Smooth-leaved Barbadoes Cherry. (*Malpighia glabra*.) Flowers from March to July, in peaty loam. Cuttings.

Linear-leaved Jacquinia. (*Jacquinia linearis*.) Flowers from May to September, in peaty loam. Cuttings.

Red Plumieria. (*Plumieria rubra*.) Flowers in July and August, in rich mould. Cuttings.

Sarmentose Strophanthus. (*Strophanthus sarmentosus*.) Flowers from May to July, in peaty loam. Cuttings.

Princely Caroline. (*Carolinea princeps*.) Flowers in July and August, in peaty loam. Cuttings.

Less Caroline. (*Carolinea minor*.) Flowers in June and July, in peaty loam. Cuttings.

Showy Caroline. (*Carolinea insignis*.)

Flowers in July and August, in peaty loam. Cuttings.

Fair Flower Fence. (*Poinciana pulcherrima*.) Flowers from June to September, in rich mould. Cuttings.

Downy Grislea. (*Grislea tomentosa*.) Flowers from May to June, in sandy peat. Cuttings.

Coloured Ardisia. (*Ardisia colorata*.) Flowers from July to August, in sandy loam. Cuttings.

Elegant Ardisia. (*Ardisia splendens*.) Flowers in June and July, in sandy loam. Cuttings.

Shrubby Cerbera. (*Cerbera fruticosa*.) Flowers in May and June, in rich mould. Cuttings.

Fragrant Pavonia. (*Pavonia odorata*.) Flowers in July and August, in sandy loam. Cuttings.

Thyme-leaved Cuphea. (*Cuphea serpyllifolia*.) Flowers from September to October, in peaty loam. Cuttings.

Large-headed Brownea. (*Brownea grandiceps*.) Sandy loam. Cuttings.

## THE ORCHIDEÆ HOUSE.

ORCHIDEOUS plants, whether regarded for the beauty of their colours, the singularity of their organization, the grotesque forms which they assume, or the delicious fragrance of their blossoms, must be admitted to be among the most extraordinary vegetable productions of the globe. It is somewhat singular, that notwithstanding the abundance in which they are found, particularly in the tropics, they should have escaped the observation of collectors so long, and equally so, that of those which were brought into Europe, so few of them were preserved for any length of time.

In the early editions of the *Hortus Kewensis* (our copy is dated 1789), only fifteen species are recognized, and up to the beginning of the present century only fifty-one species of exotic Orchideæ are enumerated in our best plant catalogues. Nor was it till within the last ten or fifteen years that the great influx of Orchideæ has taken place, and that chiefly owing to a few spirited individuals, who, struck with their extraordinary habits and beauty, made them their study, and encouraged their introduction. Amongst the most conspicuous of these is his Grace the Duke of Devonshire, who has been most liberal in his encouragement, not only by sending out collectors to discover new sorts, but also by patronising the cultivation of them at home upon a very extensive scale. With his Grace's name we may associate those of the late Mrs. A. Harrison, of Liverpool, the late Mr. Cattley, James Bateman, Esq., and the Messrs. Loddiges, Rollinsons, Low, and Knight. The collection of Messrs. Loddiges is the most ancient as well as the most extensive, and is reputed to amount to about one thousand species and varieties, altogether the most splendid collection in the world.

For the best principles of the cultivation of this tribe, and to a great extent for the taste also which has grown up within these few years, we are much indebted to Mr. Cooper, of Wentworth House, who

has for many years cultivated these plants to a degree of perfection seldom equalled and certainly never yet surpassed.

Every year is adding to the number of new species imported, and also to the number of admirers of this grotesque group of plants, so that it has now become as fashionable to possess a collection of Orchideæ as it was about the beginning of this century to possess one of heaths.

The geographical distribution of Orchideous plants is not so very equally divided as that of some other natural orders. For in Europe and other temperate regions of the globe they are less abundantly found, and towards the arctic regions disappear, while in and towards the tropics they abound in surprising numbers. In the temperate regions they are, for the most part, terrestrial, growing in meadows and pastures, while within the tropics they are chiefly parasitical, or rather epiphytal, growing upon the trunks and branches of living trees and shrubs, and also upon the trunks of those that have fallen. Some can hardly be said to have any fixed place of abode, and are found forming large tufts firmly knit together by their numerous and tortuous roots, and suffering little from being thrown about as the passing kick of the traveller may send them.

A great number of tropical Orchideous plants are found adhering to the branches of trees in the most dense forests in an epiphytal manner, not fixed parasitically by their roots to the bark of the trees that support them. In such situations they are consequently shaded from direct light by the leaves and branches which surround them: they are also placed in a moist atmosphere and high temperature, ventilation and evaporation being almost precluded.

To the fructification of Orchideous plants it may be necessary to make some allusion, inasmuch as it is still but imperfectly known; and although Mr. R. Brown and a few others seem to have the production of plants of this order from seeds at their command, still the generality of cultivators have failed in producing similar results, and not a few, otherwise intelligent and accurate in their botanical researches, deem the theory altogether visionary.

“The singular plants which constitute this class are distinguished from all others by the anomalous structure of their flowers. These do not, as is usually the case, contain a certain number of stamens, surrounding a central ovarium or style, but, on the contrary, are furnished with a solitary fleshy undivided process, round which the sepals radiate, and which supplies the place of stamens and style. The nature of this process has been variously explained: the modern opinion is, that it is formed by the accretion of the stamens and style into a single mass, and this opinion

seems to be confirmed by analysis and analogy. Omitting, therefore, a notice of such theories respecting its nature as are opposed to that which is now received as the most correct, it will suffice to explain a little in detail the opinion which is adopted in this work. The central process, called the *columna* or *column*, is understood to be formed by the filaments of three stamens surrounding a style, and by mutual accretion firmly united with it, and with each other, into a solid mass. Of these three stamens it most frequently happens that the *two lateral are sterile*, and not furnished with even the vestige of an anthera, and that their presence is not indicated by more than two irregular excrescences, as in *Orchis*, or by the same number of small appendages, as in *Satyrium*, or by two horn-like or tooth-like processes, present in several of the genera, with waxy pollen masses; it even happens, and not unfrequently, that no vestige of them remains. But in *Cypripedium* both are fertile, and bear perfect anthers, while the central stamen is barren and foliaceous.

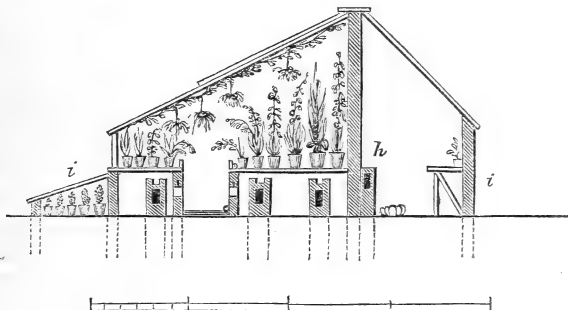
When the lateral stamens are, as above stated, abortive, which is the most common form of the column, the central stamen bears at its upper extremity an anther, which is either moveable or fixed firmly in its place. The pollen which this contains assumes three very distinct appearances in different tribes. It is either granular, dividing into many separable small pieces, as in *Orchis*; or powdery, consisting of an infinite number of granules, as in *Spiranthes*; or waxy, when it consists of a few large concrete masses, as in *Epidendrum*. The stigma is most frequently concave, and placed nearly under the anther, but in such a manner that there is no contact between it and the pollen. In what way, therefore, fecundation can take place among truly gynandrous plants, is one of those mysterious contrivances of nature which have not as yet been explained. It is generally believed to take place by absorption in some undiscovered manner before the flowers expand; but it is extremely difficult to understand how this can occur in many genera." — *Encyclopædia of Plants*.

#### ON THE CONSTRUCTION OF THE ORCHIDÆ HOUSE.

Orchideous plants require a species of cultivation peculiarly adapted to themselves, and whoever means to attempt their culture must set apart a structure for the express purpose. The dimensions of an Orchideous House must, of course, depend on the circumstances of the owner, the kind and extent of the intended collection, and some other particulars,

that can only be settled on the spot. The form and arrangement, however, may be more positively determined.

"The original house appropriated to the growth of Orchideæ, at Chatsworth [as described by Mr. Paxton, in "Magazine of Botany," Vol. ii., p. 150, and of which the annexed sketch will afford some idea], is seventy-



five feet long and twelve feet six inches wide. The walk is composed of pieces of wood nailed to sleepers, and is three feet six inches wide. The flues are inclosed in hot-air chambers, and the heat is admitted into the house by means of sliding ventilators on each side of the walk.

"On the top of the hot-air chambers the plants are placed, as seen in the accompanying section: the stones covering the chamber being always warm, give a gentle heat to the roots of the plants placed on them. The top of the air-chamber is two feet six inches above the level of the floor. The house contains three leaden water cisterns; the two end ones are three feet square, the centre one three feet wide by eight feet long, and is occupied with aquatic plants.

"There are four fire places on the common principle: the two end ones pass into the front chamber, cross under the walk in the centre of the house, pass along the back chamber, and empty themselves at each end. The two fires in the back wall pass once along the front of the back chamber, and, crossing through the wall at each end of the house, pass along the outside of the wall, and heating the back sheds, *h*, empty themselves in the centre of the back wall of the house.

The height of the back wall of the house is eleven feet six inches, and that of the front two feet six inches; on the top of the front wall is an

elevation of glass two feet six inches high, making the front five feet in height.

"In front of the house is a small pit, *i*, used for half-hardy plants. The water is conveyed into the cisterns by leaden pipes from a reservoir, and is let on or taken off at pleasure, by turning off taps fixed at each end. For the purpose of readily giving humidity to the house, perforated pipes are passed along it, which when turned on, throw water on the floor, or over the back chamber."

This house has many advantages; but we would suggest that the greenhouse species of Orchidæ, as well as the hardy exotic, and even native species, should be kept in the pit in front, and which could be readily heated at one end by forming ventilators in the front wall of the house, through which a sufficiency of heat would find its way to answer every purpose of preserving what may be denominated greenhouse species. The North American and other hardy sorts would require no other artificial heat than that of the protection afforded by the glass covering during winter, and sufficient shading during summer. By this arrangement the whole natural order would be brought together, and be more conveniently attended to than if scattered about in different parts of the garden.

Amongst other vast improvements and alterations going on at Chatsworth, a new Orchideous House has been erected, upon the metallic curvilinear principle—a circumstance we are rather surprised at, as the humidity usually kept up in houses of this kind will have a great tendency to create rust, and a consequent injury to the plants, from the condensed vapour falling back on them. We have no doubt, however, that Mr. Paxton has taken all necessary precautions to render this house as fit for the purpose as possible.

The span-roofed form of house, however, appears to us to present many very important advantages, and it would appear that some of the best cultivators of the day are of a similar opinion. The magnificent house of the Messrs. Loddiges, at Hackney, and that of the Messrs. Rollinson, at Tooting, are upon this principle; and that of Mr. Knight, in the King's Road, Chelsea, differs from them only in having a wall run up the centre, constituting as it were two houses set back to back, having a communication between them.

The house of Messrs. Loddiges is in length one hundred and forty feet, breadth eighteen feet, and ten feet high in the centre. An immense pit, filled up to nearly the height of three feet above the ground level, occupies the centre of the house, and extends towards each end, leaving sufficient

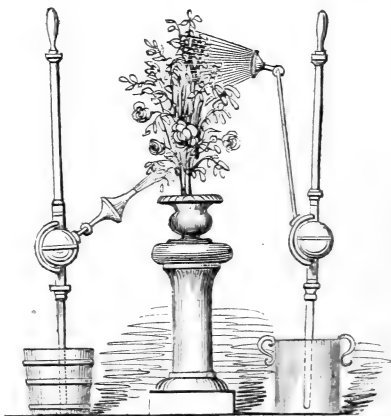
breadth for a passage round it. Upon this pit or bed the larger and taller plants are set. On each side of the house is a platform, nearly four feet wide, occupied with smaller specimens, and under these platforms the hot-water pipes are placed. From the rafters are suspended hundreds of plants, some attached to pieces of wood, others in wire or wicker baskets, some in pots mossed over, and others having only a little moss tied round them.

The majority are planted in pots, some of which are of very large size, and are intended for specimens, but those for sale vary in size from the size known as small forty-eights to that of sixteens. The house, notwithstanding its great size, is completely filled with Orchideæ, some of which are in flower at every period of the year.

The house of the Messrs. Rollinson, at Tooting, is rather less than the last, but it is the intention of the spirited and highly respectable proprietors to extend it considerably; and as difficulties of a local nature occur to prevent its extension longitudinally, it is to be by adding to it transversely, which, in our opinion, will be an advantage rather than otherwise.

The length of this house is seventy feet, the breadth fifteen, and the height at the centre ten feet two inches. The side walls are five feet high, from whence the roof springs.

This house, also, is of the span-roofed form, and is fitted up in a very neat and commodious manner. A bed or platform occupies the centre, five feet six inches wide, and on each side are tables over the hot-water pipes, two feet four inches broad, upon which the plants are set. In the middle of the house is a cistern of water, from which, by the aid of Dr. Scott's patent garden pump, as shown in the opposite sketch, the whole house, or any part of it, can be watered in a few minutes. At the end farthest from that at which the entrance is situated, and over where the boiler for the hot-water apparatus is placed, is a raised platform, upon which some splendid



specimens are placed. The house is heated by Kewley's hot-water apparatus, with one fire and four pipes, two on each side of the house, which answers the most sanguine expectations of the proprietors. Being anxious to satisfy ourselves upon the capabilities of the hot-water system during this severe winter (1838), we have applied to many of our friends for statements, and are happy to find that in no case has a deficiency of heat been experienced when the apparatus has been erected upon correct principles. The following extract from Mr. W. Rollinson's letter, now before us, says, "during the severe frost on Friday, January the 19th, we were able to command a heat of seventy-five degrees of Fahrenheit." The external temperature at the same time was ten degrees below zero at Claremont, and there could not have been much difference in the temperature at Tooting, being within ten miles.

Upon the whole this house is by far the neatest and best fitted up of any we have had an opportunity of seeing; but this is less a matter of wonder when we consider that the Tooting nursery, taking it as a whole, both in regard to cultivation and keeping, is second to none in the neighbourhood of London. If the collection of Messrs. Rollinson do not amount to so great a number of species as that of Messrs. Loddiges, there can be no doubt in saying that they are by far the best cultivated.

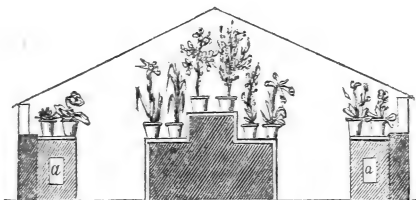
Next to these in respect to collection and keeping, is that of Mr. Knight, who, by the bye, was the first nurseryman who followed Messrs. Loddiges in cultivating this tribe of plants, and in the formation of his collection must have expended a considerable capital. He purchased the collection of the late Mr. Cattley, long considered the best private cultivator; and afterwards that of the late Mrs. A. Harrison, of Liverpool. The possession of two such collections in addition to his own, very rapidly raised Mr. Knight to a position of eminence in this particular branch of culture.

We have already observed that Mr. Knight's house is upon nearly the same principle as those above described, only being divided as it were into two, by means of a wall up the centre, but through which there is a communication. While speaking of this wall, we may here observe, that almost the only part of Mr. Knight's culture we disapprove of is, that of attempting to cover this wall with epiphytes. This is no doubt a very natural expectation when we consider the habitats of many of them. It appears, however, from the state of such plants as have been subjected to this mode of culture in this collection, and also in that of the Kew gardens, where this mode has been long in use, that however well



epiphytes may grow attached to the bark of trees, to rocks, or even to old walls, in their native country, they will not equally flourish when stuck up against a wall comparatively new, and abounding with calcareous matter, which appears to be most inimical to their constitutions.

Few of this natural order attain any extraordinary perpendicular height: those of them that are disposed to elongate to any extent, do so naturally, or may be made to do so by training horizontally; so that a low-roofed house is the most proper for them, on account of the economy in heating, and that those plants of humbler growth may derive sufficient benefit from the sun by being placed near to the glass. A structure, of any required length, and upon the principle represented in the annexed diagram, would be, in our opinion, a very fit place for the cultivation and display of Orchideous plants.



The mode of heating may either be by hot water or smoke flues, and the pipes or flues should be under the side platforms at *a, a*, which should be covered with perforated boarding or trellised work, to admit of the ascent of the heated air, not only to keep up a genial warmth around the pots, but also to heat the atmosphere of the house with the least expenditure of fuel. On these side platforms the smaller specimens should be placed, by which means they would be brought close under the glass; the larger growing sorts placed on the table or platform, in the centre of the house, and which may either be completely level, or elevated in the centre, as shown in our sketch.

We consider a cistern of water to be next to indispensable in the Orchideæ House, and would propose to place it under the centre platform, so as not to occupy space on which plants could be set.

## THE CULTIVATION OF ORCHIDEÆ.

Orchideous plants are capable of reproducing themselves by seeds, and no doubt this method is constantly going on in nature ; but the success of man in attempting to turn to his advantage this natural property, has hitherto been rarely successful. This is a matter of less regret, as the majority of them are readily increased by the separation of their parts, and is an illustration of one of the many wise provisions made by Nature, namely, that plants which rarely produce perfect seed, are capable of being increased by a variety of other means ; and again, such as are incapable of certain multiplication by those very means, as most annuals, and even a great many perennials, produce seeds in the greatest abundance.

In regard to the cultivation of Orchideous plants, we find the following very sensible and useful preliminary remarks by Mr. Paxton, in his very excellent Magazine of Botany :—" It is advisable," says he, " for every cultivator, as much as possible, to learn the native habits and situation of each separate species, in order to insure its successful management. Some species are found in low dense woods, where scarcely any sun can penetrate ; others grow on the trees near the open breaks in the wood, where they receive a little sun, plenty of light, and a free, but damp air ; others, again, are found growing on single trees, in damp but exposed situations ; and others grow on single trees in elevated situations, where they are subject to a drier air and the burning rays of a tropical sun. All these kinds are subjected to a time of drought, and a somewhat low temperature for three or four months in the year : the knowledge of which particulars marks out the line to be pursued in the cultivation of the different species.

" The plants of the first kind require shading from the rays of the sun, either by large plants in the house, by creepers, or by some other means, and must have a hot and damp atmosphere.

" Those of the second kind should have a similar atmosphere, but will endure more sunshine than the last. The greatest part of the species come under this head.

" Those of the third must also have a damp atmosphere, and plenty of heat ; but they thrive best if exposed to the sun, except just at mid-day ; for although the sun in the tropics shines with great power, it must be remembered that the plants receive considerable shelter from the branches of the trees, (although standing single), on which they grow.

" The third class require a lower temperature, less humidity, and nearly

a full exposure to the rays of the sun. The plants of all four enjoy light, a free air, and are subjected annually for three months or more to a low temperature and great drought, and it is worthy of remark that the time of drought and the decrease of temperature occur together. This may therefore, be considered their winter, or time of rest."

It must here, however, be remarked, that this season of rest does not occur at the same period to every individual species; for while some are growing vigorously, others are enjoying a repose, and that of course in the same house; and this is more obvious in newly introduced plants than in such as have been long inhabitants of our stoves, who to a very great extent accommodate themselves to the general management that they are placed under; and it is not perhaps improbable but that in course of time the whole, or at least a great part, of every collection will thus far accommodate themselves to their actual circumstances. The vine and peach trees, long accustomed to be forced, become entirely changed in this respect, and have been known to push out into bud at mid-winter, when it has happened that artificial excitement has been withheld from them.

Most of the plants of this tribe dislike to be moved from one place to another, particularly after they have become large: were it otherwise, something might be done in the way of temperature by placing them, at a proper season, at the coldest end of the house, where they should remain during their season of rest, and be also more conveniently kept dry. The time when their winter, as it may safely be called, commences, is to be determined not by the exact season of the year, but by the appearance of the plants themselves; and when they appear to have the fewest external marks of excitability, as a shedding of the foliage, a change of colour in the pseudo-bulbs, &c., may be taken for the commencement of this season.

In attempting to treat on the culture of this extraordinary tribe of plants, it will be necessary, for brevity sake, to consider them under the following heads; their great dissimilarity of character and geographical distribution rendering such an arrangement necessary.

Orchideous plants may be considered as terrestrial, or epiphytal; that is, either growing upon the ground, or attaching themselves to other vegetables, rocks, stones, &c.

The latter division is by far the most numerous, and are also the most extraordinary in their organization. They also occupy such an extent of latitude that some distinction must be made in their culture as regards temperature.

## I. EPIPHYTAL, OR PARASITICAL TROPICAL ORCHIDÆ.

## POTTING AND SOIL.

We can scarcely admit that there should be what is usually called a general shifting or potting of any plants, much less so of those under our present consideration; because the whole collection in a house can never be exactly in the same state as to growth, health, excitement, &c. Potting should be attended to according to the circumstances of individual plants, and we have found it a very good practice to examine any particular collection at different periods, selecting at each examination those individuals that most required shifting, and leaving such as did not until another time. For potting Orchidæ it may be taken as a pretty general rule as to time, that period at which their season of rest expires, or just as they are beginning to show symptoms of growing. Pots for this tribe should be large in proportion to the plants, and cannot be too well drained; indeed, from one third to one half of the pot should be taken up with drainage alone, of which broken pots, small pieces of sandstone or brickbats is the best, being well calculated to absorb a supply of water, which will be given out to the plants as they require it. Indeed, it is a good practice to mix a quantity of similar materials along with the soil in which the plants are to grow.

The soil used by the best cultivators is what is called turfy peat, of rather a sandy nature, cut from the surface of a moor or common upon which water does not lie during any part of the year, and having the surface herbage and as large a portion of fibrous matter in it as possible. Such a soil seldom requires what is called sweetening or previous preparation, such as keeping for years piled up to rot, and being frequently turned over during that time. It is, if of good quality, fit for use as soon as it is brought from the common, requiring only to be cut into pieces about an inch square, and mixed with about one-third of broken pottsherds, to render it still more capable of allowing the superfluous moisture to pass off. For it should be remembered that no species of Orchidæ will thrive if stagnated water be allowed to remain about their roots.

In potting, care should be taken that the plants be not set too deep; it is better to place them almost on the surface, and to support them with sticks, to prevent their falling over, which may be done in a neat manner,

and so as to be scarcely perceptible, by fastening the pseudo-bulbs to the stick, which need not rise above their tops. Care should also be taken in potting that the fleshy, tender roots be not broken, and also that the turfy mould be laid over them in rather an open, loose manner, to allow the roots to find an easy passage through it, as well as the superabundant moisture to escape. Many species of Orchideæ like to be planted on the top of a little pile or hillock, as it were, formed of turfy matter, considerably above the top of the pot, from whence they will send down their roots in quest of nourishment, while the crown or main body of the plant remains high and dry, and, therefore, safe from the effects of damp.

Some species prefer to be potted in moss rather than in mould, and the best sort of moss for this purpose is half-decayed *Sphagnum*; but the kinds which prefer this medium to grow in will succeed equally well if the roots be tied up in bundles of the same material, and laid on a shelf or suspended from the roof, taking care to keep them sufficiently moist by frequent waterings. Of those which appear to like this mode of treatment we may enumerate the following, but to them it is possible that many more may be added:—*Vanda*, *Aerides*, *Vanilla*, *Sarcanthus*, *Saccalobium*, part of *Epidendrum*, part of *Oncidium*, *Renanthera*, &c.

Many species will grow beautifully if laid or fixed to a piece of rough-barked rotten wood, the rough trunks of palms, on artificial rock-work, &c., according to the fancy or taste of the owner, all that is required being, to secure a little moss kept damp to their roots until they have attached themselves to the material upon which they are placed. The *Vanilla* and some others we have observed growing luxuriantly in this way; but it is more a matter of taste, and of displaying their natural habits, than one of nursery culture, as the plants become so firmly attached to the material as not very readily to be separated from it. The species which admit of this mode of culture, as well as of the last, may be equally well grown in baskets of wicker or wire-work, and suspended from the roof, and in this state while in bloom are exceedingly beautiful ornaments to bring into the drawing-room, where they may remain uninjured while they remain in bloom.

The late Mr. Cattley, who was a very successful cultivator of some species, had a box twenty or thirty feet in length suspended from the rafters of his stove; this box was filled with decayed wood, and the surface covered with green moss: in this the plants were set, and flourished exceedingly. Such a box, were it extended the whole length of a plant stove close to the back wall, and at a sufficient distance only from the glass to admit of head-room for the plants, would contain a very pretty

collection of Orchideæ, and occupy but little space that could be useful to other plants.

It would appear that the most minute and most delicate species thrive best when fastened to pieces of wood and suspended; for in this way they are less liable to be injured by wood-lice, damp, or by being overrun by other fast-growing sorts. Of the genera which thrive best in this way we may mention *Ornithocephalus*, *Stelis*, *Octomeria*, *Trizeuxis*, *Pleurothallis*, *Fernandesia*, &c.

A few of the most rapid-growing kinds, particularly those with long pendulous branches, like some of the *Dendrobiums*, cultivated in baskets or pots, and suspended from the roof, give the house a very handsome appearance; but they should not be placed over those delicate ones which require little water, because the drip from them would injure those below.

#### TEMPERATURE AND ATMOSPHERE.

Various experiments and the result of practice appear to have sufficiently established that a high temperature, and an atmosphere almost saturated with moisture, are essential requisites for the successful cultivation of this tribe. It has been found that no temperature or soil will sustain them in drought, and when warmth and humidity were supplied in sufficient abundance, soil was apparently of no importance. It may not be amiss to lay down here something like positive data on this important point of culture, and, therefore we would say, that the mean temperature of the day should be about eighty-five degrees, and that of the night ten or fifteen degrees less; the degree of humidity should be within a few degrees of saturation: this is to be understood as applying to them only during their season of growth. During their season of repose the heat should not exceed sixty-five degrees, nor be less than fifty-five degrees; while this low temperature is maintained, watering must be lessened in proportion, seldom giving any at the roots, or at least no more than will preserve the plants from perishing. The atmosphere during this period should also be kept dry; and although many of the plants may appear of a yellowish cast and rather sickly appearance, this regimen is not to be deviated from, for when their season of growth arrives, if attended to, with abundance of heat, water, and room, they will not only grow much more luxuriantly, but flower better, than if they were kept in a state of constant excitement during the whole year.

“High temperature and excessive humidity are together the only conditions essential to the well-being of these plants. The hottest countries,

if dry, and the dampest if cool, are destitute of them ; while there is no instance of a country, both hot and damp, in which they do not abound."

—*Ency. Gard.*

In regard to the proper degree of temperature and atmosphere necessary for these plants, we find the following judicious remarks in Paxton's Magazine of Botany:—"In the native habitats of these plants, the season of growth and flowering is that called the rainy season, at which time the temperature is high, and the humidity great. But the imitation of such a season in our hot-houses would be very likely to end in loss and disappointment: for although subjected to great humidity (indeed bordering on saturation) in their native country, the situation they occupy in the trees prevents the possibility of injury, except in a few instances; whereas in our artificial climates the same means used would saturate them, and they would speedily disappear. To imitate to a limited extent the above climate, may be done with benefit; therefore, during the season of growth, never allow the temperature of the house in which the plants are grown to be less than seventy-five degrees nor greater than ninety-five degrees by day, nor lower than sixty degrees or higher than seventy degrees by night.

"It is also indispensable that the atmosphere of the house be kept moist in the day-time, particularly on sunny days: but towards evening allow the moisture to dry up, otherwise, when the temperature is decreased, if humidity remains to any great degree, we have found it invariably become *injurious*, and to many small plants *fatal*: but in the morning increase the temperature, and when the house is hot pour water on the floor or other situations to fill the air with moisture."

There are few of the Orchideæ that require water at their roots: indeed, they seem impatient of it, and many plants of this tribe are lost in consequence of an undue application of it, the humidity of the atmosphere in most cases being found sufficient. But when it is evident that water is required to be so applied, it should be administered by pouring it in limited quantities round the edges of the pot, allowing as little as possible to fall on the plant, excepting in the case of the robust-growing kinds, which will be rather benefited than otherwise by a moderate syringing over their tops.

The following has been laid down by Mr. A. Scott, in a communication to Mr. Loudon, and published in the last edition of the *Ency. of Gard.*:—"The temperature of the stove should be kept while the plants are growing at about seventy degrees, but may be allowed to rise by the influence of the sun to eighty degrees, or more, according to the state of

the weather. All the strong-growing and many of the handsome species will, if the plants of them be large, succeed and flower better in a low temperature, as will nearly all the terrestrial species. The plants may be syringed once a day in fine weather, and in very warm dry weather, a more frequent syringing, if it be done with care, will be of service to many of the species. As a general caution, be sparing of giving much water to the roots, and keep up a moist heat. During the winter months, the plants may be allowed to become more dry and cool, and this condition will conduce to the flowering of many of the species. If an excess of heat and moisture be allowed, it will cause the plants to produce roots of so delicate a constitution as to be destroyed by the least declension of these elements. The condition of the atmosphere here [*exotic nursery*] has been examined when it has been deemed to be in a congenial state, and then its temperature has been seventy-five degrees of Fahrenheit, and Leslie's hygrometer has generally indicated from twenty to thirty-five degrees of dryness. The necessity of supplying moisture will depend upon such circumstances as the size of the house, the distance of the plants from the flues or hot-water pipes, the degree in which the temperature is affected by the action of the sun's heat, or by that of cold winds or other circumstances connected with the structure and aspect of the house. A sheltered, close, and humid stove is that which is most conducive to the health and growth of the Orchidæ."

Mr. Cooper, of Wentworth, one of the most successful cultivators of this tribe, and one of the longest standing, differs from most other growers in respect to humidity, giving his plants no more than is usual to give the general collection of stove plants amongst which they grow. A more successful cultivator than Mr. Cooper is no where to be found, nor one more liberal in affording information to those who desire it. His specimens of Orchidæ are truly magnificent, and some of them must be very old. Mr. Cooper and the late Mr. Cattley may be said to have been the first in this country who began collecting and cultivating this tribe of plants, and both succeeded in an eminent degree.

#### PROPAGATION.

The species of this tribe with long creeping stems, like *Renanthera*, *Vanilla*, &c., are increased by cutting the branches or stems into pieces, choosing those pieces which are furnished with roots; these, if mossed round at their base and placed in a proper atmosphere, will grow very freely. Others like the *Catasetums*, *Oncidium*s, &c., are furnished with



pseudo-bulbs, a term given by Dr. Lindley to those swellings on the stems, and which, although differently constructed, are little else than true bulbs. Each of these has usually a bud upon it, and if separated from the mass of which it forms a part, will produce another plant. Dividing the Orchideæ should be as much avoided as possible, for next to having small or bad specimens to begin cultivation with, that of constantly cutting them into pieces with a view to increase them is the next worst practice that can be followed.

*The following List of Epiphytal Tropical species would form a splendid collection, and are selected from the very choicest kinds.*

- Aerides odoratum* Lou.—Native of China, extremely fragrant. The *A. cornutum* of Bot. Mag. is only a synonyme.
- Aeranthès sesquipetalis* Lindl.—Native of Madagascar; a very splendid species.
- grandiflora* Lindl.—Also from Madagascar; highly ornamental.
- Angulosa grandiflora* Kth.—Native of South America.
- superba*.—Native of Peru.
- Batemannia Colleyi*.—A new genus, of great beauty, named conjunctly after Joseph Bateman, Esq., and his collector, Mr. Colley; a native of Demerara.
- Brassia caudata* Lindl.—Native of the West Indies; an elegant species.
- maculata* Brown.—Native of Jamaica; an elegant species.
- Lanceana*.—A new species, named after J. H. Lance, Esq., who discovered it in Demerara.
- Brasavola nodosa*. The *Epidendrum nodosum* of Linn. and the *Cymbidium nodosum* of Swartz, are only synonyms.—Native of the West Indies; very fragrant.
- cucullata* Brown.—Also a native of the West Indies, particularly of Jamaica; very fragrant. Both should have a place in every collection.
- Cœlogyne punctulata* Lindl. } Both natives of the East Indies, and both equally  
*nitida* Lindl. } beautiful; the latter is fragrant.
- fimbriata* Lindl.—Native of China.
- Catasetum tridentatum* Hook.—Native of Trinidad.
- Claveringi* Lindl.—Native of Brazil.
- floribundum* Hook.—Native of Trinidad.
- lucidum*.—The two first are supposed to be the same, only altered in appearance by cultivation.
- Cattleya labiata* Lindl. }  
*Loddigesii* Lindl. } Natives of South America, and very elegant.  
*Forbesii* Lindl. }
- crispa* Lindl.—Native of Rio, and considered the most splendid of the family.
- Ceratochilus grandiflorus* Lod. } Both natives of Trinidad, and both very handsome. The latter is the *Stanhopea insignis* of  
*insignis* Lindl. } Hooker, and of many collections.
- Cirrhcæa Warreana* Lodd.—Native of Brazil.
- Loddigesii* Lindl.—Native country scarcely known; both species are exceedingly beautiful.
- Cyrtopodium Andersonii* R. Brown.—Native of the East Indies.
- Woodfordii* Bot. Mag. } Both natives of South America, and all three  
*glutinosum* Mey. } worth the attention of the cultivator.
- Dendrobium speciosum* Swartz.—Native of the warmer parts of New South Wales.

- Dendrobium* *Pierardi* *Rox.*—Native of the East Indies.  
*Calceolaria* *Hook.*—Native of the East Indies.  
*pulchellum.*—Native of Sylhet.  
*moschatum* *Wallich.*—Native of Pegu.  
*longicornu* *Lindl.*—Native of Nepal.  
*chrysanthum* *Wallich.*—Native of Nepal; a splendid genus, and well deserving the attention of cultivators.
- Epidendrum* *fragrans* *Swartz.*—Native of Jamaica; very fragrant.  
*cuspidatum* *Lodd.*—Native of the West Indies.  
*nocturnum* *L.*—Native of Jamaica; fragrant at night.  
*bicornutum.*—Very fragrant during the day.  
*odoratissimum.*—Although almost destitute of beauty, its fragrance renders it desirable in every collection.  
*ciliare* *L.*—Native of the West Indies.
- Gongora* *atropurpurea* *Hook.*—Native of Trinidad and Demerara.  
*speciosa* *Hook.*—Native of Brazil. Both elegant flowering plants, and of easy culture.
- Maxillaria* *Harrisoniæ* *Lindl.*—Native of South America.  
*racemosa* *Hook.*—Native of South America.  
*picta.*  
*tetragona.*—Native of Brazil, exceedingly fragrant.  
*aromatica.*—Exceedingly fragrant.
- Monacanthus* *discolor* }  
*viridis* } Two very interesting species.
- Oncidium.*—Of this beautiful genus it would be even difficult to make a selection; they are all exceedingly worth cultivating, and are natives of the West Indies, Mexico, and Brazil.
- Ornithidium* *coccineum* *Sal.*—Native of the West Indies.
- Renanthera* *coccinea* *Lou.*—Native of China, one of the most splendid of all Epiphytes.
- Rodriguezia* *secunda* *Kth.*—Native of South America.
- Sarcochilus* *falcatus* *R. Brown.*—Native of New Holland.
- Saccolobium* *guttatum.*—An interesting species.
- Sarcanthus* *paniculatus* *Lindl.*—Native of China.  
*præmorsus* *Lindl.*—Native of the East Indies.
- Stanhopea* *insignis.*—Native of Trinidad; a splendid species.
- Vanda* *Roxburghii* *R. Brown.* }  
*multiflora* *Lindl.* } Both natives of China, elegant species.
- Zygopetalum* *Mackai* *Hook.*—Native of Brazil.  
*rostratum* *Hook.*—Native of Demerara.

## II. TERRESTRIAL TROPICAL ORCHIDEÆ.

### POTTING AND SOIL.

Much of what we have advanced when treating of tropical epiphytes is also applicable to those which are terrestrial also. Both require a season of rest, and that season happens not to all species alike. A careful eye must be kept upon them, for many of the herbaceous kinds die down to the ground annually, and when that is observed, they should be removed to a cooler place, and kept very dry, to prevent them from becoming excited too soon. The winter is certainly the best time for this suspension of growth, but there will be some in all large collections which will continue in growth at all seasons of the year.

ORCHIDEÆ.



*Cypripedium Calceolus*

*Dendrobium sinibratum.*

*Dendrobium Moniliforme.*



In regard to potting, it is necessary to pay every attention to have them well drained, as they are more liable to suffer from an excess of damp than the epiphytal species, and a soil of turfy, sandy peat, with a small portion of mould of decayed tree leaves, is found to be best for them.

In regard to temperature, the majority of them require the same as the epiphytal ones: there are a few exceptions in regard to this in the case of some Chinese species; but these can be placed at the coldest end of the house.

*The following List includes most of the finest flowering species of this section.*

- Arethusa plicata* Andr.—Native of the East Indies.  
*Bletia Tankervilleæ* R. Brown.—Native of China.  
     *florida* R. Brown.—Native of the West Indies.  
     *verecunda* R. Brown.—Native of the West Indies.  
     *speciosa* Kth.—Native of Mexico.  
     *gracilis* Lodd.—Native of Mexico.  
     *hyacintha* R. Brown.—Native of China.  
*Bonatea speciosa* Wild.—Native of the Cape of Good Hope.  
*Calathea veratrifolia* R. Brown.—Native of the East Indies.  
     *sylvestris* Lindl.—Native of Madagascar.  
*Cymbidium aloifolium* Swartz.—Native of the East Indies.  
     *longifolium* Hook.—Native of the East Indies.  
     *Sinense* Wild.—Native of China, very fragrant.  
     *ensifolium* Swartz.—Native of China, very fragrant.  
*Cypripedium venustum* Wal. } Both natives of Nepal.  
     *insigne* Wal. }  
*Diuris aurea* Sm.—Native of New South Wales.  
*Eulophia guineensis* R. Brown.—Native of Sierra Leone.  
*Geodorum purpureum* R. Brown.—Native of the East Indies.  
     *citrinum* Hort. Kew.—Native of the East Indies.  
     *dilatatum* R. Brown.—Native of the East Indies.  
*Habenaria alata* Hook.—Native of the West Indies.  
     *dilatata* Hook.—Native of the West Indies.  
*Lissochilus speciosus* R. Brown.—Native of the Cape of Good Hope.  
     *lutea* Swartz.—Native of the Cape of Good Hope.  
*Neottia grandiflora* Hook.—Native of Rio Janeiro.  
     *picta* Sims.—Native of Trinidad.  
*Peristeria elata*.—Native of Panama: the dove plant.  
*Pelexia spiranthoides* R. Brown.—Native of the West Indies.  
*Stenorhynchus orchioides* Rich.—Native of Jamaica.  
     *speciosus* Rich.—Native of the West Indies.

### III. EPIPHYTAL, OR PARASITICAL, EXTRA-TROPICAL ORCHIDEÆ.

The species which come under this head are as yet few in number, and those which we have selected will flourish in a well-regulated greenhouse, and hence be within the means of those who do not possess a stove, and are, at the same time, curious in having a few of these extraordinary plants in their collection.

In regard to culture, it will be understood that, being subjected to the mild temperature of the greenhouse, the supply of water must be much less than recommended for similar plants in the stove temperature. It is needless almost to remark, that the hottest part of the greenhouse is the best situation for them.

*List of Epiphytal or Parasitical Extra-tropical Orchideæ, or such as may be cultivated in a good Greenhouse.*

- Vanda cruenta* Lindl.—Native of China.  
*tessellata* Lodd.—Native of China.  
*Sarcanthus rostratus* Lindl.—Native of China.  
*succisus* R. Brown.—Native of China.  
*Epidendrum conopseum* Bartr.—Native of Florida.  
*Dendrobium æmulum* R. Brown.—Native of New South Wales.  
*canaliculatum* R. Brown.—Native of New Holland.  
*undulatum* R. Brown.—Native of New Holland.  
*teretifolium* R. Brown.—Native of New Holland.

IV. TERRESTRIAL EXTRA-TROPICAL ORCHIDEÆ.

*List of the best flowering Extra-tropical Terrestrial Orchideæ, or such as may be cultivated in a good Greenhouse.*

- Disa grandiflora* L.—Native of the Cape of Good Hope.  
*cornuta* Swartz.—Native of the Cape of Good Hope.  
*lacera* Swartz.—Native of the Cape of Good Hope.  
*flexuosa* Swartz.—Native of the Cape of Good Hope.  
*Pterygodium alatum* Swartz.—Native of the Cape of Good Hope.  
*Satyrium carneum* R. Brown.—Native of the Cape of Good Hope.  
*Bonatea speciosa* Wild.—Native of the Cape of Good Hope.  
*Orchis longicornu* Poir.—Native of Barbary.  
*acuminata* Desf.—Native of Barbary.  
*undulata* Biv.—Native of Sicily.  
*Habenaria flava* R. Brown.—Native of New Holland.  
*Ophrys atrata* Bot. Reg.—Native of Gibraltar.  
*tenthredinifera* Wild.—Native of Barbary.  
*lutea* Hook.—Native of Spain.  
*Goodyera discolor* Bot. Reg.—Native of South America.  
*Diuris aurea* Sm.—Native of New South Wales.  
*maculata* R. Brown.—Native of New Holland.  
*Neottia australis* Lindl.—Native of New Holland.  
*Calochilus campestris* R. Brown } Both natives of New Holland.  
*paludosus* R. Brown }  
*Arethusa bulbosa* Hort. Kew.—Native of North America.  
*Calopogon pulchellus* Hort. Kew.—Native of North America.  
*Prasophyllum elatum* R. Brown.—Native of New Holland.  
*fimbriatum* R. Brown.—Native of New Holland.  
*striatum* R. Brown.—Native of New Holland.  
*Acianthus fornicatus* R. Brown.—Native of New Holland.  
*Pterostylis curta* R. Brown }  
*nutans* R. Brown } Natives of New Holland.  
*cucullata* R. Brown }  
*Corysanthes fimbriata* R. Brown } Both natives of New Holland.  
*unguiculata* R. Brown }

*Dipodium punctatum* R. Brown.—Native of New Holland.

*Eulophia streptopetala* Bot. Reg.—Native of the Cape of Good Hope.

*ensata* Bot. Reg.—Native of the Cape of Good Hope.

Some of these are by no means plentiful in the country : many of them, however, are, and most may be, procured from their native countries without much difficulty. We have lately received, through the kindness of Thomas Keer Short, Esq., of Marten Hall, several very rare and curious species of the above, as well as some others, which may prove new to the collections in this country.

“The *Petrostylis* and *Prasophyllum* requires rather strong, rich loam and shade: the *Diuris* a light, sandy soil, but rather rich, and the *Caladenia* will do in the same. You must be cautious not to over-water them, nor give them heat, as they will not bear it. I grow mine in a cold frame, carefully excluding the frost.”—*Extract of a Letter from Mr. Short.*

The Orchideæ House appears to be the most proper habitation for that most singular of plants the Chinese Pitcher plant (*Nepenthes distillatoria*) as well as its ally the *Nepenthes phyllamphora*, Pitcher leaf. They are natives of China and the East Indies, and are of great rarity and of difficult culture, few having a proper place of accommodation for them. They require a high temperature and a humid atmosphere, and probably a considerable degree of shade. They are propagated by seeds, which should be sown as soon as ripe in a pot filled about half way up with small stones mixed with moss, over which should be placed two or three inches of moss, and about half an inch of finely sifted mould to form a smooth surface on which to sow the seeds. As the seeds are very small, they should not be covered with mould, but should have a bell-glass placed over them, and the pots placed in a temperature of about seventy or eighty degrees of heat. The pots should be set in a pan of water kept filled, which, by capillary attraction, renders the contents sufficiently moist for the purpose of vegetation. When the plants have attained the height of an inch or two they should be carefully transferred to single pots, but these should be of considerable size, that the plants may not require shifting into a larger, as that cannot be done without danger. As the plant extends in length it should be supported by a trellis, or suspended from the rafters of the stove.

## SELECT LIST OF STOVE ORCHIDÆ.

*As the colours in this extraordinary order of plants vary so much according to the state the flower may be in, in regard to culture and age, and as few of them are of one colour, we have arranged them in the order in which the colour most predominates in them.*

## WHITE.

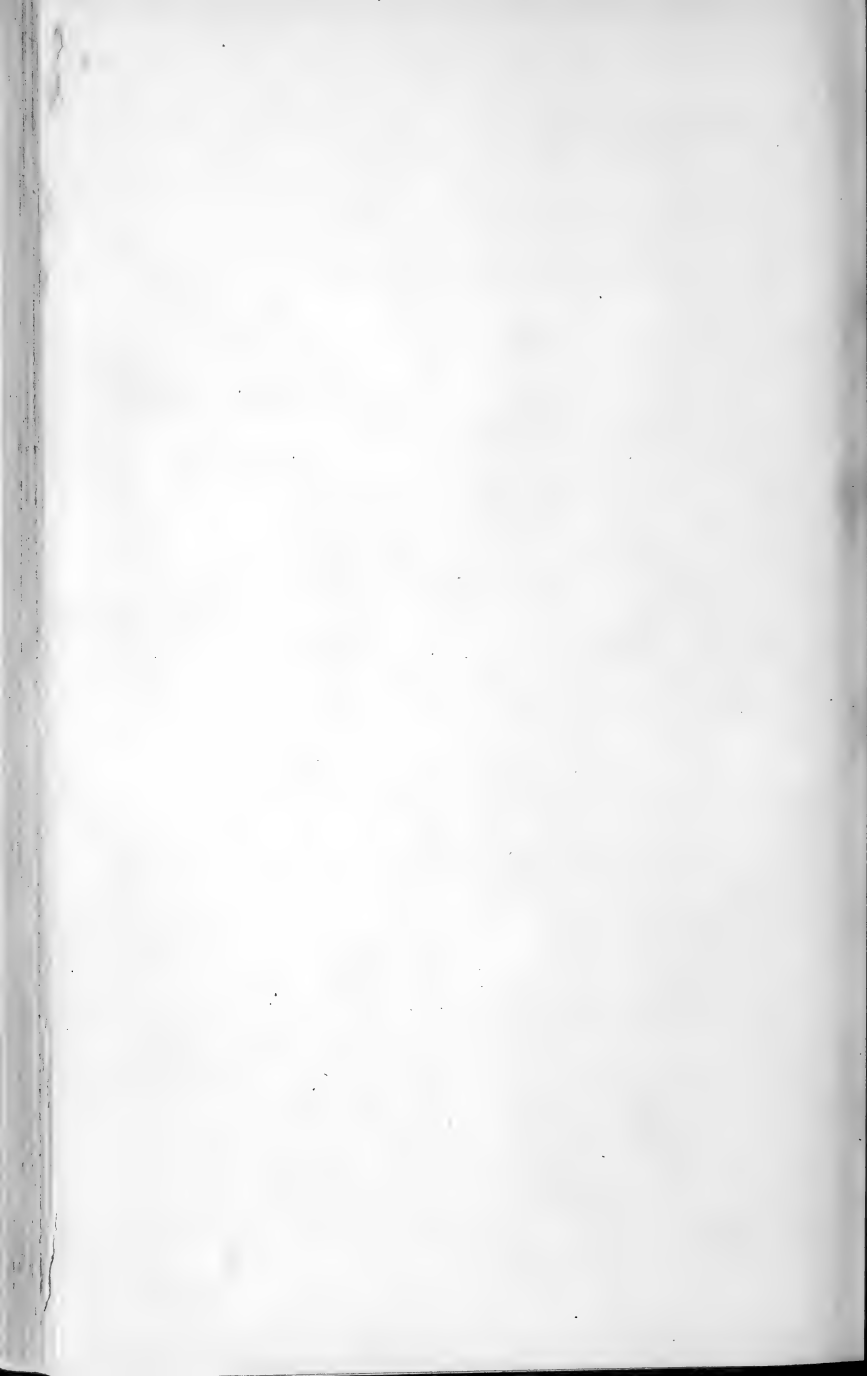
- Two-coloured Goodyera. (*Goodyera discolor*.) Flowers in November and December, in turfy peat. Division of the plant.
- Rival Dendrobium. (*Dendrobium æmulum*.) Flowers in April and May, in turfy peat. Division of the plant.
- Pursed Dendrobium. (*Dendrobium crumenatum*.) Flowers in April and May, in turfy peat. Division of the plant.
- Fringed Epidendrum. (*Epidendrum ciliare*.) Flowers from March to August, in turfy peat. Division of the plant.
- Night-smelling Epidendrum. (*Epidendrum nocturnum*.) Flowers from September to October, in turfy peat. Division of the plant.
- Two-horned Epidendrum. (*Epidendrum bicornutum*.) Flowers from September to October, in turfy peat. Division of the plant.
- Falcate Angræcum. (*Angræcum falcatum*.) Flowers from November to December, in turfy peat. Division of the plant.
- Veratrum-leaved Calanthe. (*Calanthe veratrifolia*.) Flowers in June and July, in turfy peat. Division of the plant.
- Drooping Cælogyne. (*Cælogyne flaccida*.) Flowers from February to March, in turfy peat. Division of the plant.
- Painted Neottia. (*Neottia picta*.) Flowers in April and June, in turfy peat. Division of the plant.
- Tall Neottia. (*Neottia elata*.) Flowers from April to July, in turfy peat. Division of the plant.
- Three-winged fruited Cymbidium. (*Cymbidium tripterum*.) Flowers in June and July, in turfy peat. Division of the plant.
- Hooded Brasavola. (*Brasavola cucullata*.) Flowers from June to September, in turfy peat. Division of the plant.
- Aromatic Vanella. (*Vanella aromatica*.) Flowers from June to August, in rotten sticks and moss. Cuttings.
- Smooth-leaved Vanella. (*Vanella planifolia*.) Flowers in April and June, in rotten sticks and moss. Cuttings.
- Curled-flowered Cattleya. (*Cattleya crispa*.) Flowers in August, in turfy peat. Division of the plant.

## GREEN.

- Great-flowered Neottia. (*Neottia grandiflora*.) Flowers from April to June, in turfy peat. Division of the plant.
- Woodford's Bletia. (*Bletia Woodfordii*.) Flowers in June and July, in turfy peat. Division of the plant.







- Bitten Sarcanthus. (*Sarcanthus præmorsus*.) Flowers from May to August, in turfy peat. Division of the plant.
- Xiphium-leaved Cymbidium. (*Cymbidium xiphiifolia*.) Flowers from March to August, in turfy peat. Division of the plant.
- Crested Catasetum. (*Catasetum cristatum*.) Flowers from October to November, in turfy peat. Division of the plant.
- One-leaved Epidendrum. (*Epidendrum monophyllum*.) Flowers in December, in turfy peat. Division of the plant.
- Lizard-head Pleurothallis. (*Pleurothallis saurocephalus*.) Flowers in April and May, in turfy peat. Division of the plant.
- Lurid Catasetum. (*Catasetum luridum*.) Flowers from March to May, in turfy peat. Division of the plant.
- Lurid Oncidium. (*Oncidium luridum*.) Flowers from February to March, in turfy peat. Division of the plant.
- Dwarf Oncidium. (*Oncidium pumilum*.) Flowers in June and July, in turfy peat. Division of the plant.
- Carthaginian Oncidium. (*Oncidium carthaginense*.) Flowers in May and June. Division of the plant.
- Plantain-leaved Prescotia. (*Prescotia plantaginea*.) Flowers in April and August, in turfy peat. Division of the root.
- Handsome Ladies' slipper. (*Cypripedium venustum*.) Flowers in July and August, in turfy peat. Division of the plant.
- Admirable Ladies' Slipper. (*Cypripedium insigne*.) Flowers in July and August, in turfy peat. Division of the plant.
- Diffuse Epidendrum. (*Epidendrum diffusum*.) Flowers from September to November, in turfy peat. Division of the plant.
- Large-flowered Aeranthus. (*Aeranthus grandiflora*.) Flowers in June and July, in turfy peat. Division of the plant.
- Ophiogloss-like Stelis. (*Stelis ophioglossoides*.) Flowers in May and June, in turfy peat. Division of the plant.
- Small-flowered Stelis. (*Stelis micrantha*.) Flowers from November to December, in turfy peat. Division of the plant.
- Fringed Maxillaria. (*Maxillaria ciliata*.) Flowers from April to July, in turfy peat. Division of the plant.
- Green-flowered Monachanthus. (*Monachanthus discolor*, var. *viridiflorus*.) Flowers in June and July, in turfy peat. Division of the plant.

## YELLOW.

- Recurved Gomeza. (*Gomeza recurva*.) Flowers from May to July, in turfy peat. Division of the plant.
- Parker's Maxillaria. (*Maxillaria Parkerii*.) Flowers from September to October, in turfy peat. Division of the plant.
- Racemose Maxillaria. (*Maxillaria racemosa*.) Flowers in May and June, in turfy peat. Division of the plant.
- Aromatic Maxillaria. (*Maxillaria aromatica*.) Flowers from May to June, in turfy peat. Division of the plant.
- Lofty Dove-flower. (*Peristeria elata*.) Flowers from September to October, in turfy peat. Division of the plant.
- Lance's Pleurothallis. (*Pleurothallis Lanceana*.) Flowers in August, in turfy peat. Division of the plant.
- Pale-flowered Maxillaria. (*Maxillaria pallidiflora*.) Flowers from September to October, in turfy peat. Division of the plant.
- Mrs. Harrison's Maxillaria. (*Maxillaria Harrisonæ*.) Flowers from September to October, in turfy peat. Division of the plant.
- Anderson's Cyrtopodium. (*Cyrtopodium Andersonii*.) Flowers from May to August, in turfy peat. Division of the plant.
- Golden-flowered Chysis. (*Chysis aurea*.) Flowers in July and August, in turfy peat. Division of the plant.
- Showy Lissochilus. (*Lissochilus speciosus*.) Flowers in May and June, in turfy peat. Division of the plant.
- Yellow Lissochilus. (*Lissochilus luteus*.) Flowers from April to July, in turfy peat. Division of the plant.
- Tallest Oncidium. (*Oncidium altissimum*.) Flowers from August to September, in turfy peat. Division of the plant.
- Flexuous Oncidium. (*Oncidium flexuosum*.) Flowers in June and July, in turfy peat. Division of the plant.
- Cebollet's Oncidium. (*Oncidium Cebolletii*.) Flowers in July and August, in turfy peat. Division of the plant.

Dotted-flowered Cœlogyne. (*Cœlogyne punctulenta*.) Flowers from July to August, in turfy peat. Division of the plant.

Shining-leaved Cœlogyne. (*Cœlogyne nitida*.) Flowers in May and August, in turfy peat. Division of the plant.

Fringed Dendrobium. (*Dendrobium fimbriatum*.) Flowers from April to June, in turfy peat. Division of the plant.

Many-flowered Dendrobium. (*Dendrobium densiflorum*.) Flowers in June and July, in turfy peat. Division of the plant.

Pubescent Eria. (*Eria pubescens*.) Flowers from March to May, in turfy peat. Division of the plant.

Grass-leaved Octomeria. (*Octomeria graminifolia*.) Flowers in June and July, in turfy peat. Division of the plant.

Serrated-leaved Octomeria. (*Octomeria serratifolia*.) Flowers from November to December, in turfy peat. Division of the plant.

Many-flowered Vanda. (*Vanda multiflora*.) Flowers in June and July, in turfy peat. Division of the plant.

Bearded Oncidium. (*Oncidium barbatum*.) Flowers in April and May, in turfy peat. Division of the plant.

Downy Oncidium. (*Oncidium pubescens*.) Flowers in July and August, in turfy peat. Division of the plant.

Showy Gongora. (*Gongora speciosa*.) Flowers in June and July, in turfy peat. Division of the plant.

Sweet-scented Epidendrum. (*Epidendrum fragrans*.) Flowers from October to November, in turfy peat. Division of the plant.

Panicked Sarcanthus. (*Sarcanthus paniculatus*.) Flowers in May and August. Division of the plant.

Cylindric-leaved Sarcanthus. (*Sarcanthus teretifolius*.) Flowers from November to December, in turfy peat. Division of the plant.

Elegant Fernandesia. (*Fernandesia elegans*.) Flowers in June and July, in turfy peat. Division of the plant.

#### BROWN.

Aloe-leaved Cymbidium. (*Cymbidium aloifolium*.) Flowers in May and June, in turfy peat. Division of the plant.

Sword-leaved Cymbidium. (*Cymbidium ensifolium*.) Flowers from June to October, in turfy peat. Division of the plant.

Chinese Cymbidium. (*Cymbidium sinense*.) Flowers from September to October, in turfy peat. Division of the plant.

Lurid Angræcum. (*Angræcum luridum*.) Flowers from September to November, in turfy peat. Division of the plant.

Spiral Epidendrum. (*Epidendrum cochleatum*.) Flowers from February to December, in turfy peat. Division of the plant.

Brown Epidendrum. (*Epidendrum fuscum*.) Flowers in June and July, in turfy peat. Division of the plant.

Starred Eria. (*Eria stellata*.) Flowers from February to March, in turfy peat. Division of the plant.

Spider-like Air-plant. (*Aerides arach-*

*nites*.) Flowers from September to October, in turfy peat. Division of the plant.

Two-spurred Corysanthes. (*Corysanthes bicalcarata*.) Flowers in July and August, in turfy peat. Division of the root.

Fringed Corysanthes. (*Corysanthes fimbriata*.) Flowers in July and August, in turfy peat. Division of the root.

Golden-Brown Maxillaria. (*Maxillaria aureo-fulva*.) Flowers in June and July, in turfy peat. Division of the plant.

Three-toothed Catasetum. (*Catasetum tridentatum*.) Flowers in July and August, in turfy peat. Division of the plant.

Bundle-flowered Catasetum. (*Catasetum floribundum*.) Flowers from October to November, in turfy peat. Division of the plant.

Crisp-flowering Oncidium. (*Oncidium crispum*.) Flowers from September to October, in turfy peat. Division of the plant.

#### PURPLE.

Dark purple Gongora. (*Gongora atropurpurea*.) Flowers in June and July, in turfy peat. Division of the plant.

Great-flowered Ceratochilus. (*Ceratochilus grandiflorus*.) Flowers from July to October, in turfy peat. Division of the plant.

Noble *Ceratochilus*. (*Ceratochilus insignis*.) Flowers from July to October, in turfy peat. Division of the plant.

Showy *Dendrobium*. (*Dendrobium speciosum*.) Flowers from June to August, in turfy peat. Division of the plant.

Modest *Bletia*. (*Bletia verecunda*.) Flowers from January to May, in turfy peat. Division of the plant.

Florid *Bletia*. (*Bletia florida*.) Flowers

in July and August, in turfy peat. Division of the plant.

Guinea *Bletia*. (*Bletia guineensis*.) Flowers from February to March, in turfy peat. Division of the plant.

Hyacinth-like *Bletia*. (*Bletia hyacinthina*.) Flowers from March to June, in turfy peat. Division of the plant.

Shepherd's *Bletia*. (*Bletia Shepherdii*.) Flowers in June and July, in turfy peat. Division of the plant.

## RED.

Side-flowering *Roderiguezia*. (*Roderiguezia secunda*.) Flowers from September to October, in turfy peat. Division of the plant.

Rose-like *Eria*. (*Eria rosea*.) Flowers from November to December, in turfy peat. Division of the plant.

Side-flowering *Epidendrum*. (*Epidendrum secundum*.) Flowers from June

to August, in turfy peat. Division of the plant.

Long-stalked *Epidendrum*. (*Epidendrum elongatum*.) Flowers in May and August, in turfy peat. Division of the plant.

Bloody-flowered *Vanda*. (*Vanda cruenta*.) Flowers from August to September, in turfy peat. Division of the plant.

## SCARLET.

Blood-coloured *Broughtonia*. (*Broughtonia sanguinea*.) Flowers in June and July, in turfy peat. Division of the plant.

Showy *Stenorrhynchus*. (*Stenorrhynchus speciosa*.) Flowers in April and

June, in turfy peat. Division of the plant.

Scarlet *Renanthera*. (*Renanthera coecinea*.) Flowers in March and May, in rotten wood and moss. Cuttings.

## PINK.

Woodford's *Cyrtopodium*. (*Cyrtopodium Woodfordii*.) Flowers from October to December, in turfy peat. Division of the plant.

Secund *Dendrobium*. (*Dendrobium secundum*.) Flowers in June and July, in turfy peat. Division of the plant.

Intermediate *Cattleya*. (*Cattleya intermedia*.) Flowers in April and May, in turfy peat. Division of the plant.

Forbes's *Cattleya*. (*Cattleya Forbesii*.) Flowers in July and August, in turfy peat. Division of the plant.

Pallid *Bletia*. (*Bletia pallida*.) Flowers from February to March, in turfy peat. Division of the plant.

Guinea *Eulophia*. (*Eulophia guineensis*.) Flowers from May to July,

in turfy peat. Division of the plant.

Spotted *Angræcum*. (*Angræcum maculatum*.) Flowers from October to November, in turfy peat. Division of the plant.

Pierard's *Dendrobium*. (*Dendrobium Pierardi*.) Flowers from March to May, in turfy peat. Division of the plant.

Slipper *Dendrobium*. (*Dendrobium calceolaria*.) Flowers from April to June, in turfy peat. Division of the plant.

Elliptic *Epidendrum*. (*Epidendrum ellipticum*.) Flowers from March to August, in turfy peat. Division of the plant.

Fragrant Air-plant. (*Aerides fragrans*.) Flowers in June and July, in turfy peat. Cuttings.

## VIOLET.

Dark-lipped Cattleya. (*Cattleya labiata*.) Flowers in July and August, in turfy peat. Division of the plant.

Loddiges' Cattleya. (*Cattleya Loddigesii*.) Flowers in July and August, in turfy peat. Division of the plant.

## SPOTTED AND VARIEGATED.

Mackay's Zygopetalum. (*Zygopetalum Mackii*.) Flowers in June and July, in turfy peat. Division of the plant.

Beaked Zygopetalum. (*Zygopetalum rostratum*.) Flowers in September and October, in turfy peat. Division of the plant.

Shell-lipped Zygopetalum. (*Zygopetalum cochleare*.) Flowers from September to October, in turfy peat. Division of the plant.

Horned Oncidium. (*Oncidium cornigerum*.) Flowers in June and July, in turfy peat. Division of the plant.

Butterfly Plant. (*Oncidium papilio*.) Flowers from March to May, in turfy peat. Division of the plant.

Neat Oncidium. (*Oncidium pulchellum*.) Flowers in July and August, in turfy peat. Division of the plant.

Triangular-leaved Oncidium. (*Oncidium triquetrum*.) Flowers from September to October, in turfy peat. Division of the plant.

Spotted-flowered Brassia. (*Brassia maculata*.) Flowers in June and July, in turfy peat. Division of the plant.

Long-tailed Brassia. (*Brassia caudata*.) Flowers in June and July, in turfy peat. Division of the plant.

Rostrate Sarcanthus. (*Sarcanthus rostratus*.) Flowers from November to December, in turfy peat. Division of the plant.

Lopped-off Sarcanthus. (*Sarcanthus succisus*.) Flowers from November to December, in turfy peat. Division of the plant.

Orange-coloured Bifrenaria. (*Bifrenaria aurantiaca*.) Flowers from September to October, in turfy peat. Division of the plant.

Deppe's Maxillaria. (*Maxillaria Deppii*.) Flowers in July and August, in turfy peat. Division of the plant.

Bearded Fly-wort. (*Myanthus barbatus*, var. *labello albo*.) Flowers in November and December, in turfy peat. Division of the plant.

Spotted Cyrtopodium. (*Cyrtopodium punctatum*.) Flowers in July and August, in turfy peat. Division of the plant.

Ivory-lipped Stanhopea. (*Stanhopea eburnea*.) Flowers from September to October, in turfy peat. Division of the plant.

Coriaceous-leaved Epidendrum. (*Epidendrum coriaceum*.) Flowers in June and July, in turfy peat. Division of the plant.

Acute-petaled Epidendrum. (*Epidendrum stenopetalum*.) Flowers in June and July, in turfy peat. Division of the plant.

Thick-leaved Epidendrum. (*Epidendrum crassifolium*.) Flowers from September to October, in turfy peat. Division of the plant.

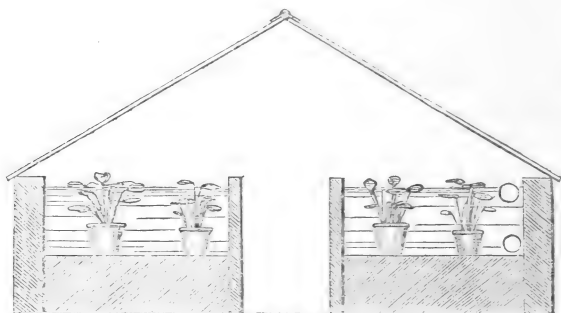
## THE AQUARIUM.

THIS species of plant-house has hitherto been met with only in establishments of the first order; but as there are many extremely beautiful and singular plants which require to be grown in water, and as their culture is perhaps the most simple of any, we think it proper to allude to them here. An Aquarium will afford a great source of amusement to those who are fond of plants, and whose avocations require their absence for considerable periods, as the plants grown in it do not require to be watered like other plants, nor frequently shifted or re-potted, but will continue to flourish for months during summer, with little other care than that of ventilation, which any domestic may be taught to do in the absence of the proprietor.

To those interested in the cultivation of this tribe of plants, the following remarks may be deemed useful. The temperature should be maintained from fifty-five to sixty-five degrees by artificial means, but by solar heat it may be allowed to rise to ninety degrees. All aquatics should be grown in pots or tubs, because many of their roots are of the tuberous kind, and some of them require to be taken out of the water during their season of rest. Nevertheless, these should be, during their growing season, set in a cistern of water, both to afford a sufficient supply of food to them by their roots, as well as to admit of the leaves of the floating kinds resting on the surface of the water.

Aquatics require the greatest possible degree of light: a house, therefore, that presents the largest surface of glass, must be looked upon as the most proper, nor should they be placed at too great a distance from the glass, on which account a commodious pit or low span-roofed house is the best kind of structure for the purpose. Such a house as is represented in the annexed diagram would have many advantages, and should be constructed in the following manner. The length, as in all similar

cases, must be determined by local circumstances ; but we should say one of twenty-five feet by twelve feet in breadth would contain a very full collection of these plants. The height in the middle should not exceed eight feet, and the passage should occupy the centre, having a cistern of slate, iron, or stone on each side, four and a half feet broad each, and two feet deep, excepting at one end, where it should be two and a half or three feet deep for the reception of some of the stronger growing kinds, that require to be grown in large pots or tubs, and whose foliage floats on the surface.



These cisterns should be furnished with a waste pipe at one end for the purpose of drawing off the water when necessary, either entirely or partially, to admit of a constant fresh supply, which is very necessary in the cultivation of these plants ; and if this supply can be conveniently brought by a pipe from some other cistern or source, it will render the whole more complete.

In regard to heating an Aquarium, hot water is certainly the best, and for this purpose the pipes should be laid within the cistern, as shown in the sketch, by which means the water in it will be rendered tepid, and give out its heat to the atmosphere of the house. The top pipe, however, should not be more than half covered with water, which will allow a considerable escape of heat from its upper surface into the house. In the cistern through which the hot-water pipe runs, should be grown the plants natives of the warmer parts of the tropics, and in the other, which will be much cooler, the plants from more temperate climates, thus, as it were, combining a receptacle both for what are usually called stove and



also greenhouse aquatics. The furnace and boiler might be placed under the cistern, and the fire managed from without, by merely sinking a space sufficient to admit of the operator when attending to the fire; this, at all other times, could be easily concealed, and thereby a nuisance be avoided, which furnaces and hot-house fire-places certainly are.

There are few examples of this kind in Britain: the only one we have seen being that erected many years ago at White Knights, for the Duke of Marlborough, by Todd, and described by him in his work on hot-house architecture. That was, however, a very imperfect model. Cultivators in general have grown their aquatics in pits, and in this way the late Kent, of Clapton, was eminently successful; but by far the majority content themselves by placing them in tubs of water, and setting them in the plant stoves—most frequently in the part most remote from the glass, and consequently the darkest: hence the few specimens of these plants to be seen even in good collections, and the want of success in their cultivation, so much complained of. No plants are more easily cultivated if placed in a proper position in regard to light and heat: these are the two conditions upon which success depends, for the nature of the soil they are grown in is, we think, of little importance.

Many of the most beautiful aquatic plants may be very successfully grown in large tubs or small cisterns, placed in a pit of the ordinary description, where a regular Aquarium cannot be afforded; and this pit might be heated by dung linings, or still better by hot-water, introduced from a boiler, which might be employed in heating several other similar structures. Mr. Loudon has proposed a very simple and convenient cistern for growing *Nymphæas* and other low-growing aquatics, by elevating it upon pillars in the open air, and when the season of forcing commences, to be covered with a hot-bed frame of the same dimensions, and surrounded by linings of hot dung. By this means any required degree of heat might be produced during the flowering season: and if it were desired to keep any of the plants in a growing state during winter, the linings and frame could be continued. If not, most of them, by being carefully protected from frost, would safely remain in a dormant state till spring.

#### GENERAL MANAGEMENT OF AQUATIC PLANTS.

The genera which chiefly claim admission into the Aquarium on account of the beauty of their flowers, are the family *Nymphæa*, *Limncharis*, *Menyanthus*, *Pontederia*, *Nelumbium*, *Aponogeton*, *Euryale*, &c., and as a plant historically interesting, the *Cyperus papyrus*, and the rice plant,

*Oryza sativa*. Almost all aquatic plants are readily propagated by seeds, or by parting their roots. The seeds of aquatic plants should be sown as soon as they are ripe, for, if we except *Nelumbium speciosum*, they lose their vegetative powers if kept long in the air; and when it becomes necessary to transport them to a distance, they are usually sent in bottles of water. In this way Otto of Berlin received the seeds of *Zizania aquatica*, or Canada rice, sent from that country to Europe. Seeds of aquatics are best sown in the water, and in due time they will vegetate and grow without much further trouble.

The genera *Limnocharis*, *Menyanthus*, *Pontederia*, and *Apogoneton*, propagate freely by parting their roots, which becomes a measure of necessity, on account of the rapidity of their growth: the two latter are comparatively hardy, and will sometimes survive the winter, if mild, in the open ponds. They may also be successfully cultivated if planted in deep pans or tubs, having nine inches or a foot of strong, rich loam in their bottom, and filled to the depth of a foot or eighteen inches with water, which should be occasionally changed. These pans or tubs may be placed on the top of a flue near the light in any warm greenhouse or stove, where there is not a regular Aquarium, and in such situations they will flower freely.

The genus *Nymphaea*, having tuberous roots, should be examined annually in autumn, the small ones removed, and the larger ones kept for flowering; these roots should be planted in small pots of the size called large sixties, one root in each, and kept dormant till spring by being kept rather dry. In March they should be forced into a vegetating state by the application of water and a little degree of heat, and as soon as they have sprung about half an inch should be planted either into the bottom of the cistern in the Aquarium, or into deep pans or tubs, in a rich, light, loamy soil, to be placed near the light in the plant stove. The full depth of water should not be let upon them at first: a few inches only over their roots is sufficient, but as they extend in growth add more water progressively until the vessel containing them be full. When the *Nymphaeas* begin to vegetate, care must be taken that they experience no check in their growth either by a diminished supply of water or heat, or other causes; for if such be the case they will not flower, but form bulbs at the root instead. They should, if in a proper condition, show flowers in about a month or five weeks after planting, and if so will continue in flower most of the season. As soon as the plants have done flowering, and have perfected their seeds, they die down to the bottom, and form bulbs in the soil in which they are planted. It is at this period that the

separation of their root should take place, when they may be potted as above. Some species seed freely, and when such is the case the seeds, if a great supply of plants be desired, should be sown immediately after they are ripe, in pots of light, rich mould, and immediately plunged into water to the depth of two or three inches.

N. STELLATA

Seeds freely, but does not propagate very readily at the root; it is, therefore, better to treat it as an annual. When the seeds vegetate, they should be transplanted into separate pots, for one plant is quite sufficient for a small pot, which it will soon fill with roots, and require to be planted out in the cistern to expand its ramifications, and gain strength enough to produce its beautiful flowers. As the foliage of most aquatics floats on the surface of the water, and presents a broad horizontal surface, it becomes necessary to water them, both to remove the dust and filth which will be deposited upon them, and also to refresh them, like other plants.

EURYALE,

Of which there is only one species, is, strictly speaking, only an annual plant; its seeds should be sown as soon as procured, whether by importation or by its culture at home; for few aquatic plants will vegetate if their seeds are long kept out of the water: the *Nelumbium* is probably the only exception. The seeds of *Euryale* should be sown in rich, loamy soil, and plunged about two inches under the surface of the water in the cistern; when the plants have vegetated, they should be separated, and planted singly into pots, to be afterwards planted out in the cistern in the Aquarium, or in a large tub or pan plunged in the tan bed of a plant stove, but placed as near the light as possible.

NELUMBIIUM.

This splendid plant was successfully cultivated by the late Mr. Kent, of Clapton; he has detailed the substance of his mode of culture in the *Hort. Soc. Transactions*, vol. iii. p. 36, to the following effect:—"The *Nelumbium* is easily raised from seed, which retains its vegetative powers for forty years, and with every advantage, in a fair season, will produce blossoms the first summer. It is generally grown in large tubs, with a few inches depth of water over the surface of the mould, placed in the tan bed of the stove. By these means I raised a fine plant last year;

the seed was sown in May, and threw up several flower buds, which did not come to perfection, but most probably would have done so had the seeds been sown two months earlier. The leaves produced were about two feet in diameter; but the plant went off in the winter, notwithstanding it was treated in the manner heretofore found the most successful, which has been, to allow the tub to remain in the tan, and become nearly dry, giving it no more water than the other plants around it." By the above mode of culture we have seen this plant brought to flower, and produce its seeds in the fullest perfection.

The following practical directions are from the pen of a contributor to the *Gardener's Magazine*, and appear to us so simple and excellent that we will give the essence of the practice.

"The seed is prepared for sowing by filing a small hole in the shell at the end opposite the point: it is then put into a basin of water, kept warm, and in about ten days it will have made its first leaf: it is then to be planted in a tub about three feet wide and eighteen inches deep, filled to about five inches of the top with mud. That part of the tub covered with water should be painted, to prevent the green *Conferva* from growing; the mud should also be covered about an inch with fine sand, for the same purpose. The water should be changed twice a week, and the sand slightly moved. The young leaves should be bent down to the surface of the sand by placing a small stone on them, until the stalk has grown long enough to remain out of the water. During the day the temperature should be kept up to about seventy-five or eighty degrees, but at night the house should be left open when the weather is not cold, as also sometimes on rainy days. Towards the middle of September they should be gradually inured to the open air, and left there without covering till the following spring, when they should be put into another tub about the beginning of May.

"The late Mr. Stewart, of Valleyfield, used to flower this splendid plant in great perfection, by adopting a course of culture very different from that followed by most other cultivators. The tub in which his plants grew was plunged in the corner of a pine pit in a temperature during summer from sixty-five to ninety degrees, and even one hundred degrees, but in winter seldom above sixty degrees of Fahrenheit. During winter the plants received little water, the supply being gradually diminished from the time the plants flowered until they became almost dry, in which state they remained during winter. In spring water was increased, and as soon as the foliage had grown above the surface the old earth was carefully removed from round the roots, and replaced with

strong, rich loam. After this the tub was kept nearly full of water, to allow the leaves to float, and was thus maintained until they had risen between eighteen and twenty inches in height; the water was then reduced, by allowing it gradually to escape through the staves, the top hoops being slackened on purpose, until it was lowered to nearly the surface of the mould. Fresh water was supplied every evening, and allowed thus to drain off during the growth and flowering of the plants; and as the leaves and flowers died away gradually, so was the water reduced, until the tub became nearly dry."

#### CYPERUS PAPYRUS, OR PAPYRUS ANTIQUORUM.

This plant is less ornamental in its flowering than any of the plants above treated of: it is also of much easier culture, requiring only to be planted in a cistern, deep pan, or tub, kept moist, and is readily increased by separation at the roots.

#### ORYZA SATIVA

Is more a plant of curiosity than beauty. Its seeds should be sown immediately after they are ripe, and immersed in water, for they soon lose their vegetative properties if left exposed to the air.

All the aquatic plants we have treated of, with the exception of the *Cyperus papyrus*, which attains too great a height, may be and are all cultivated successfully in pits and frames heated by dung linings. In this way the late Kent, of Clapton, the venerable curator of the Chelsea Botanical Garden, while gardener to J. Vere, Esq., of Kensington Gore, and others, have grown them, the plants being planted in small cisterns, deep tubs, and pans, plunged in tan; and by this plan any person at all curious in such plants may flower them in great perfection. Indeed, the whole tribe seems to prefer a close, moist heat, such as that produced from fermentable matter, and to be placed near to the light, which is more readily effected in pits or frames than in houses generally.

The *Papyrus antiquorum* is a plant of great antiquity, and afforded the material from which the ancient Egyptians made paper, "which was obtained from the pellicle found between the flesh and the bark of the thick part of the stalk, ribbons of which were united till they formed the size required, and were then pressed and dried in the sun."

For culture of *Nepenthes distillatoria*, see ORCHIDÆ HOUSE.

## ELECT LIST OF STOVE AQUATICS.

## BLUE.

- Kidney-leaved Heteranthera. (*Heteranthera reniforme*.) Flowers in July and August, in rich mould. Suckers.
- Blue Water-lily. (*Nymphaea caerulea*.) Flowers from June to September, in rich mould. Division of the roots.
- Indian Water-lily. (*Nymphaea cyanea*.) Flowers from June to September, in rich mould. Division of the root.
- Strict Herpestris. (*Herpestris stricta*.) Flowers in August, in rich mould. Division of the plant.
- Jamaica Sacred Bean. (*Nelumbium jamaicense*.) Flowers from June to August, in rich mould. Division of the root.
- Whited Thalia. (*Thalia dealbata*.) Flowers in July and August, in peat and loam. Division of the root.
- Blue Pontederia. (*Pontederia azurea*.) Flowers in July and August, in rich mould. Offsets.
- Spreading Pontederia. (*Pontederia dilatata*.) Flowers in May and June, in rich mould. Division of the root.
- Lanceolate Pontederia. (*Pontederia lanceolata*.) Flowers from August to October, in rich mould. Division of the root.
- Thick-petioled Pontederia. (*Pontederia crassipes*.) Flowers from September to October, in rich mould. Offsets.
- Star-flowered Water-lily. (*Nymphaea stellata*.) Flowers from June to September, in peat and loam. Roots.
- Acute-leaved Water-lily. (*Nymphaea acutifolia*.) Flowers in July and September, in peat and loam. Roots.

## WHITE.

- Two-spiked Aponogeton. (*Aponogeton distachyon*.) Flowers in May and June, in rich mould. Offsets.
- Narrow-leaved Aponogeton. (*Aponogeton angustifolia*.) Flowers from April to September, in peat and loam. Offsets.
- Venus' Fly-trap. (*Dionaea Muscipula*.) Flowers in July and August, in peat and loam, mixed with half-rotten spagnum or other mosses. Offsets.
- Ample-leaved Water-lily. (*Nymphaea ampla*.) Flowers from June to September, in peat and loam. Roots.
- Few-flowered Sun-dew. (*Drosera pauciflora*.) Flowers in July and August, in peat. Seeds.
- Stemless Sun-dew. (*Drosera acaulis*.) Flowers from June to August, in peat. Seeds.
- Binate-leaved Sun-dew. (*Drosera binata*.) Flowers from June to August, in peat. Seeds.
- Follicled Cephalotus. (*Cephalotus follicularis*.) Flowers in June, in peat. Seeds.
- Charming Water-lily. (*Nymphaea blanda*.) Flowers from June to September, in rich mould. Division of the root.
- Eatable Water-lily. (*Nymphaea edulis*.) Flowers from June to September, in rich mould. Division of the root.
- Heart-leaved Water-plantain. (*Alisma cordifolia*.) Flowers in July and August, in rich mould. Division of the plant.
- Triangular Desmanthus. (*Desmanthus triquetrus*.) Flowers in July and August, in rich mould. Division of the plant.

Indian Villarsia. (*Villarsia indica*.) Flowers from June to September, in rich mould. Suckers.

Curl-leaved Aponogeton. (*Aponogeton crispum*.) Flowers from June to September, in rich mould. Offsets.

Indian Damasonium. (*Damasonium indicum*.) Flowers from July to September, in rich mould. Seeds.

Acute-leaved Arrow-head. (*Sagittaria acutifolia*.) Flowers in June and July, in rich mould. Division of the plant.

*Victoria Regina*. Flowers in its native country, British Guiana, in January. From all we at present know of this extraordinary aquatic, it is probable that its culture will be the same as that of *Euryale ferox*, *Nymphæa*, &c., to which it is nearly allied. It was discovered by R. H. Schomburgk, Esq., in 1837, and named after her majesty the Queen. Mr. S. transmitted the original drawings to the Botanical Society of London, accompanied with a description, which was read before that society September 7th, 1837, and of which the following is an extract:—"While contending with the difficulties nature opposed in different forms to our progress up the river Berbice, we arrived at a point where the river expanded, and formed a currentless basin; some object on the southern extremity of this basin attracted my attention—it was impossible to form any idea what it could be, and animating the crew to increase the rate of paddling, shortly afterwards we were opposite the object which had raised my curiosity—a *vegetable wonder*! All calamities were forgotten: I felt as a botanist, and felt myself rewarded. A gigantic leaf, from five to six feet in diameter, salver-shaped, with a broad rim of a light green above, and a vivid crimson below, resting upon the water; quite in character with the wonderful

leaf was the luxuriant flower, consisting of many hundred petals, passing in alternate tints from pure white to rose and pink. The smooth water was covered with them; I rowed from one to another, and observed always something new to admire. The leaf on its surface is of a bright green, in form orbiculate, with this exception opposite its axis, where it is slightly bent in; its diameter measured from five to six feet; around the margin extended a rim, about three to five inches high, on the inside light green, like the surface of the leaf; on the outside, like the leaf's lower part, of a bright crimson. The stem of the flower is an inch thick near the calyx, and is studded with sharp elastic prickles, about three-quarters of an inch in length. The calyx is four-leaved, each upwards of seven inches in length, and three in breadth at the base; they are thick, white inside, reddish brown and prickly outside. The diameter of the calyx is twelve or thirteen inches; on it rests the magnificent flower, which, when fully developed, covers completely the calyx with its hundred petals. When it first opens it is white with pink in the middle, which spreads over the whole flower the more it advances in age, and it is in general found the next day of a pink colour: as if to enhance its beauty, it is sweet-scented: like others of its tribe, it possesses a fleshy disk, and petals and stamens pass gradually into each other, and many petaloid leaves may be observed, which have vestiges of an anther. We met them afterwards frequently, and the higher we advanced the more gigantic they became: we measured a leaf, which was six feet five inches in diameter, its rim five and a half inches high, and the flower across fifteen inches."

## YELLOW.

Plumier's Limncharis. (*Limncharis Plumierii*.) Flowers from June to November, in rich mould. Seeds.

Humboldt's Limncharis. (*Limncharis Humboldtii*.) Flowers from June to November, in rich mould. Seeds.

Yellow Sacred Bean. (*Nelumbium luteum*.) Flowers from June to Au-

gust, in rich mould. Division of the root.

Floating Jussiaea. (*Jussiaea natans*.) Flowers from August to September, in rich mould. Cuttings.

Pitcher-leaf. (*Nepenthes phyllamphora*.) Flowers in July and August, in peat and loam. Seeds.

## RED.

Fierce Euryale. (*Euryale ferox.*)  
Flowers from July to September,  
in rich mould. Division of the  
root.

Floating Touch-me-not. (*Impatiens*

*natans.*) Flowers in July and Sep-  
tember, in peat and loam. Seeds.

Red-flowered Water-lily. (*Nymphaea*  
*rubra.*) Flowers in July and August,  
in rich mould. Division of the root.

## PINK.

Pubescent Water-lily. (*Nymphaea pu-  
bescens.*) Flowers from May to Au-  
gust, in rich mould. Division of the  
root.

Showy Sacred Bean. (*Nelumbium spe-  
ciosum.*) Flowers from June to Au-  
gust, in rich mould. Division of the  
root.

Simple-spiked Aponogeton. (*Apono-  
geton monostachyon.*) Flowers from  
August to October, in rich mould.  
Offsets.

Caspian Sacred Bean. (*Nelumbium*  
*caspicum.*) Flowers from June to  
August, in rich mould. Division of  
the root.

## APETALOUS.

Ancient Papyrus. (*Papyrus antiquo-  
rum.*) Flowers from July to Sep-  
tember, in rich mould. Division of  
the root.

Sweet-scented Papyrus. (*Papyrus*  
*odoratus.*) Flowers in July and Au-  
gust, in rich mould. Division of the  
the root.

Elegant Papyrus. (*Papyrus elegans.*)  
Flowers in July and August, in peat  
and loam. Offsets.

Lax-flowered Papyrus. (*Papyrus*  
*laxiflorus.*) Flowers in July and  
August, in peat and loam. Off-  
sets.

## BROWN.

Spiral Vallisneria. (*Vallisneria spiralis.*) Flowers in July, in peat and loam.  
Seeds.

## ORANGE.

Ovate-leaved Villarsia. (*Villarsia ovata.*) Flowers in May and June, in peat and  
loam. Suckers.

## GREEN.

Chinese Pitcher-plant. (*Nepenthes distillatoria.*) Flowers in April and May, in  
peat and loam, mixed with moss. Seeds.



## THE PALM STOVE.

THE Palms constitute of themselves an entire group or order in the natural system of arrangement, viz., *Palmæ*. Some of them have been known from the earliest times as supplying fruit, and even far more valuable products. Several of them are cultivated with great care and assiduity in tropical countries, where only the majority of them will exist. They are amongst the most gigantic of the vegetable kingdom, yet, nevertheless, many of them were introduced to Europe a century or two ago, and we may venture to state, that from one hundred and fifty to one hundred and seventy distinct species are cultivated in the collection of the Messrs. Loddiges alone, by far the richest collection of these plants in Europe.

Dr. Von Martius, a Bavarian traveller in Brazil, has done more to elucidate the natural habits and botanical characters of these plants, than all the botanists who preceded him. He has published some excellent remarks on the characters of the order, and concludes them in the following interesting manner :—" Palms, the noble offspring of Terra and Phœbus, are natives of those happy countries within the tropics, where the rays of the latter are ever beaming. In all such climates they are to be found, —with this limitation, however, that in the southern hemisphere they do not overstep the thirty-fifth degree of latitude, nor in the northern the fortieth. Most species are confined within fixed and narrow bounds ; for it comes to pass, that wherever a district is characterized by striking peculiarities of soil or climate, those species exist that are not found elsewhere ; but few, on the contrary, extend over a large extent of surface, as the *Cocos nucifera*, *Acrocromia sclerocarpa*, *Borassus flabelliformis*, &c. It is probable that the number of palms existing on the face of the earth, will be found by future travellers to amount to as many as a thousand species. Most of them love the margins of springs and streams, but few establish themselves on the shore of the ocean, and yet a smaller number ascend into the alpine regions of their country. Some collect in large forests, some are scattered singly or in clusters among woods and plains.

In the most ancient periods of the world, when the genera of plants were beginning to be formed, palms scarcely existed ; they were preceded in the creation by the more ancient ferns, *Cycadeæ*, grasses, and *Equisetaceæ*. Some of their remains have, however, been found in variegated sandstone, and in limestone of the third order, part of which belong to unknown species, and part to species still in existence. But in the times succeeding the deluge, they appear, from written evidence of historians and poets, to have followed the footsteps of man, to whom their fruit yielded food, drink, and oil ; their stems, houses, arms, utensils, flowers, and wine ; and their leaves, cordages, and roofs for habitations. In cultivation, their soil should be slightly saline ; they are propagated by seeds more readily than by truncheons of the stem ; when cultivated, they undergo no alteration, except in producing more fleshy or stemless fruit : it is extremely difficult to transplant them beyond their own country ; naturally, their migration is absolutely opposed by the barriers of the ocean."

"The culture of palms," as Mr. Loudon justly observes, "is less a matter of nicety than expense. They require a powerful moist heat, a large mass of rich earth in the pot, tub, or bed, and ample space for the leaves. As they are of remarkably slow growth, a stove devoted to their culture does not require to exceed the common height at first ; but, to admit the tree palms to display their character, it would require to have the roof elevated by degrees to sixty, eighty, or a hundred feet. It is much to be wished that some spirited man of wealth would, in these times of peace and leisure, distinguish himself by palm culture, of which Messrs. Loddiges have, much to their honour, set the first example. It is a common opinion that their growth is so slow, that little effect would be produced during a lifetime ; but this, every gardener who has supplied his palms with abundance of space for their roots, and adequate heat in their atmosphere, can witness against."

The largest and finest grown species of palms in Europe are at the Earl of Tankerville's, at Walton-on-Thames, and the extraordinary progress that these have made within these last five or six years, since the stove was enlarged for them, is astonishing, and confirms the opinion above quoted. These palms have long ago extended their roots beyond the limits of tubs or boxes, and have established themselves in what was originally the tan-pit, in which they were plunged ; how far their roots may have extended beyond the limits of that bed it is impossible to say.

The following are a part of that collection :—*Zamia pungen*s, sixty years old, is four feet three inches and a half in circumference in the stem, the

leaves being five feet two inches in length. Some years ago this splendid specimen flowered, and produced an immense number of seeds, but being a female plant, and no male near it, they were of course abortive. *Latania rubra*, fifty years old, two feet six inches in circumference in stem, and the leaves eight feet long. *Phoenix dactylifera*, sixty years old, seven feet four inches in circumference in stem, and the leaves thirty feet long. *Corypha umbraculifera*, sixty years old, eight feet six inches round the stem, and with leaves fifteen feet in length.

Next in importance to these, exclusive of some of Loddiges', are those in the magnificent palm-stove in the garden at Rennwegg, in Germany, remarkable for its large palms; and in that at Schonbrunn, the *Cocos nucifera*, *Elæis guineensis*, *Caryota urens*, and *Corypha umbraculifera*, have attained a very large size.

One species of palm, *Cycas circinalis*, affords the well-known farinaceous nutriment sago. This plant, which with us seldom exceeds two or three feet in the trunk, attains a large size in the islands of the Indian Archipelago, in which the easterly monsoon is the most boisterous and rainy. It is found in most abundance in those islands in which the clove and nutmeg are most propitiously grown. There are immense forests of it in the great island of Ceram, in low, damp, marshy places, and in these the finest sago plantations are in bogs knee-deep of mud and water. The utmost age at which the tree arrives in its native country is calculated at thirty years. There are specimens of it, however, considerably above that age in our European collections.

#### THE COCOA-NUT PALM (*Cocos nucifera*).

"The cocoa-nut tree," says Mr. Porter, in the Tropical Agriculturist, "is considered by some writers to be richer in the amount and variety of its produce than any other known plant of the tropical regions, abounding as they do in luxuriant specimens of vegetation. More than one valuable product is drawn from its fruit, besides which, in an earlier state of vegetation, the flower-bud is made to yield its liquid sweets."

In such great veneration do the natives of Hindostan, where it has been cultivated from the earliest ages, hold this tree, that to cut it down is considered one of their greatest crimes; and amongst the nineteen castes into which Brahma divided those tribes who still venerate him, one caste is exclusively devoted to the cultivation of this tree, and preparing its valuable products. This caste, like the Levites in the Mosaic law, is the most distinguished, and ranks with those who are said to be of

the *right hand*. Cordiner says of this tree, that the man who plants one of them "confers a lasting benefit on himself, and hands down to posterity more certain riches than can be procured in less genial climates by a life of the most toilsome labour. When the seeds or slips are once put into the ground they require no cultivation, no pruning, no kind of attention, but spontaneously advance to maturity, and yield a regular and never-failing produce."

In those climates where the mean temperature of the air is below seventy-seven degrees, this tree will not succeed. Every kind of soil appears to suit it if abundantly supplied with water. One peculiarity in its native culture deserves the attention of the British cultivator, namely, its delighting in a saline soil and maritime situation. Bertolacci says, "it flourishes so very near the sea, that its roots are in many places washed by its waters, without injury, until it is actually undermined." When it is intended to make a plantation of these trees in the interior of Malabar, at a distance from the sea, Dr. Von Martius asserts that it is the customary practice to throw as much as a half bushel of salt into the hole which receives the cocoa-nut. The natural duration of the tree appears to be about eighty or eighty-five years. Till it attains the age of thirty-five years its growth is rapid; after that period its developement is slower, and it gradually declines after passing its fiftieth year.

The cocoa-nut is propagated only from its fruit, which should be sown as soon as it can be procured after its arrival in this country. The soundest nut should be selected, and sown in deep pots, so as to be covered at least three or four inches deep, laying the nut in a slanting position, so that the eye may be presented towards the surface of the mould. None of the outer covering should be displaced, as it retains an equable degree of moisture round the shell, which hastens the germination of the seed. About four or five weeks after sowing, if abundance of moisture and heat be applied, the roots will burst through the shell, and the future stem, or rather the first leaf, will begin to develop itself, at first white and smooth like a piece of ivory, at which period it is extremely tender, and considered an excellent article of food, either eaten raw or roasted in the ashes.

It is stated in the *Tropical Agriculturist*, "that if by accident a cocoa-nut tree should be deprived of its top, that the roots cease to acquire nourishment, and the stem is reduced to dust in the course of eight or ten days. In this respect it differs remarkably from other large trees, which, being topped, the trunks sprout out into vigorous vegetation." Whether this circumstance has been noticed in European

culture we know not, but, at all events, it deserves the attention of the horticulturist.

Of the other palms which are of important utility to man, we may mention the date (*Phoenix dactylifera*), the fruit of which is served up in our desserts; but its principal use is in affording the chief portion of food to the inhabitants of Arabia and part of Persia. The date has been cultivated and used as a nutritious food from the earliest ages, and there is no part of the tree but is turned to some useful account.

The great fan palm, *Corypha umbraculifera*, is one of the most noble of the class. It attains a great height, and from the top produces leaves in the shape of an immense fan, twenty feet long and fifteen wide. A production of such magnitude and durability could not fail to claim the attention of the natives in the earliest ages, and hence we find the leaves of this palm employed in covering houses, and, according to Knox, in his History of Ceylon, these leaves, being cut into triangular pieces, are used by the natives as a protection from the rain and sun. When they travel, they lay these pieces upon their heads, with the narrow end foremost, the more readily to make their way through the thickets. "Soldiers also carry them, not only to shade them from the sun, and to keep them dry in case of rain on their march, but to make their tents to lie under." As a fruit-bearing tree, the same historian says, "It bears no fruit until the last year of its life; and then yellow blossoms, most lovely to behold, but smelling very strongly, come out on the top, and spread abroad amongst the branches; these come to a fruit, round and very hard, as big as our largest cherries, in such abundance, that one tree will yield seed enough for a country, but not good enough to eat."

The leaves are used for writing upon, and books formed of them are sold to Europeans for the Egyptian papyrus.

The leaves of *Licuala spinosa* are used in the isle of Celebes, and in Macassar, for making tobacco pipes; and the wood of *Thrinax parviflora* in Jamaica for piles in wharfs and buildings made in the sea, as they are durable, and the worms do not attack them.

In most countries where the palms grow, their leaves are almost universally used for thatch, forming a durable covering, and one which is capable of throwing off the water.

## PROPAGATION OF PALMS.

The majority of Palms are increased by seeds ; but as these rarely ripen in Europe, they are usually imported from their native countries, and for the most part arrive in better condition for vegetation than tropical seeds in general.

A paper on the propagation of *Zamias*, which may be applied to other species also, was sent to the Horticultural Society by Mr. Falderman, chief gardener in the imperial botanic gardens at St. Petersburg, detailing his success in increasing the *Zamia horrida* from the hard scales which form the bases of the leaves. The substance of this communication was, that the stem of a plant of the above species became to all appearance dead, the centre having entirely rotted within it. The cavity thus formed was filled with dry sand, the plant placed in a dry, shaded part of the stove, and covered with a bell-glass ; in the course of three months the scales pushed out small leaves and roots, when they were carefully separated and planted singly in pots, in white sand, in which they grew, and ultimately produced good plants. *Zamia* and *Cycas* of different species have been propagated in this country by destroying the centre of the stem, upon exactly the same physiological principle as that of destroying the centre of a bulb, or propagating by scales, those bulbs which form them having the rudiment of a bud or leaf at their apex.

Some species of *Zamia* propagate by suckers, but rarely, while *Chamærops humilis* and *C. serrulata* increase freely by the same means, and *Rhapis flabelliformis* is readily increased by division of the root.

## SELECT LIST OF PALMS.

*Palms being for the most part apetalous, that is, without coloured petals or flowers, we shall give the height in feet of each species, specifying such as are cultivated in the tropics, and the mode of reproduction, instead of the colour of the flower and time of flowering, given in the foregoing Select Lists.*

- Acrocomia minor*, 20 feet, seeds.  
     *tenuifolia*, 30, seeds.  
     *aculeata*, 40, seeds.  
     *horrida*, 30, seeds.  
     *globosa*, 20, seeds.  
     *sclerocarpa*, 40, seeds.  
*Areca humilis*, 6, seeds. Cultivated.  
     *oleracea*, 40, seeds. Cultivated.  
     *crinata*, 20, seeds.  
     *exilis*, 30, seeds.  
     *montana*, 30, seeds.  
     *rubra*, 30, seeds.  
     *Catechu*, 30, seeds.  
*Aetrocaryum acaule*, 10, seeds.  
     *campestre*, 10, seeds.  
     *vulgare*, 30, seeds.  
     *aculeatum*, 40, seeds.  
*Attalia humilis*, 10, seeds.  
     *compacta*, 22, seeds.  
     *excelsa*, 70, seeds.  
     *speciosa*, 70, seeds.  
     *Rossii*, 20, seeds.  
     *funifera*, 40, seeds.  
*Bactris minor*, 12, seeds.  
     *major*, 25, seeds.  
*Borassus flabelliformis*, 30, seeds.  
*Calamus niger*, 20, seeds.  
     *albus*, 50, seeds.  
     *rudentum*, 200, seeds.  
     *draco*, 50, seeds.  
     *verus*, 20, seeds.  
*Caryota urens*, 20, seeds.  
     *mitis*, 20, seeds.  
     *horrida*, 20, seeds.  
*Chamædorea gracilis*, 10, suckers.  
     *fragrans*, 8, suckers.  
*Cocos nucifera*, 50, seeds. Cultivated.  
     *plumosa*, 50, seeds.  
     *flexuosa*, 50, seeds.  
*Corypha umbraculifera*, 100, seeds.  
     *elata*, 150, seeds.  
     *glaucescens*, 150, seeds.  
     *tectorum*, 15, seeds.  
     *Utan*, 50, seeds.  
     *Pumos*, 20, seeds.  
     *australis*, 50, seeds.  
*Cycas revoluta*, 3, seeds and scales.  
     *circinalis*, 3, seeds and scales.  
     *glauca*, 4, seeds, scales, and suckers.  
     *squarrosa*, 4, seeds, scales, and suckers.  
     *angulata*, 4, scales and suckers.  
*Desmoncus dubius*, 6, seeds.  
     *polycanthus*, 6, seeds.  
     *americanus*, 6, seeds.  
*Diplothemium maritima*, 10, seeds.  
*Elæis occidentalis*, 30, seeds.  
     *pernambucana*, 50, seeds.  
     *melanococca*, 30, seeds.  
*Elate sylvestris*, 14, seeds.  
*Euterpe globosa*, 30, seeds.  
     *oleracea*, 30, seeds.  
     *caribæa*, 30, seeds.  
*Geonoma acaulis*, 5, seeds.  
     *Spixiana*, 15, seeds.  
     *pinnatifrons*, 15, seeds.  
     *simplicifrons*, 5, seeds.  
*Gomutus saccharifer*, 40, seeds.  
*Hyphæne coriacea*, 20, seeds.  
*Latania rubra*, 15, seeds.  
     *borbonica*, 20, seeds.  
     *glaucophylla*, 15, seeds.  
*Lodoicea sechellarum*, 80, seeds.  
*Livistonia inermis*, 10, seeds.  
     *humilis*, 5, seeds.  
*Leopoldina pulchra*, 60, seeds.  
*Licula spinosa*, 6, seeds.

- Licula peltata*, 6, seeds.  
*Maximiliana regia*, 60, seeds.  
*Mauritia flexuosa*, 40, seeds.  
     *vinifera*, 50, seeds.  
     *armata*, 50, seeds.  
*Monieria saccifera*, 30, seeds.  
*Nipa frutescens*, 10, seeds.  
*Cenocarpus Batava*, 40, seeds.  
*Phoenix dactylifera*, 40, seeds and suck-  
     ers. Cultivated.  
     *reclinata*, 10, seeds.  
     *acaulis*, 6, seeds.  
     *paludosa*, 20, seeds.  
     *sylvestris*, 20, seeds.  
     *farinifera*, 30, seeds.  
     *pygmœa*, 6, seeds.  
     *leonensis*, 30, seeds.  
*Rhapis flabelliformis*, 6, roots.  
     *arundinacea*, 6, roots.  
*Sabal Blackburniana*, 6, seeds.
- Sabal Adansoni*, 6, seeds.  
     *graminifolia*, 6, seeds.  
     *umbraculifera*, 6, seeds.  
     *Palmeto*, 6, seeds.  
*Sagus Rumphii*, 50, suckers. Culti-  
     vated  
     *vinifera*, 50, seeds.  
     *pedunculata*, 50, seeds.  
*Taliera bengalensis*, 100, seeds.  
*Zamia pungens*, 10, scales.  
     *latifolia*, 6, scales.  
     *horrida*, 5, scales.  
     *furfuracea*, 3, scales.  
     *tenuis*, 1, scales.  
     *repanda*, 6, scales.  
     *spiralis*, 3, scales.  
     *spinosa*, 5, scales.  
     *pumila*, 18 in., scales.  
     *debilis*, 1, scales.



## THE TROPICAL FRUIT STOVE.

WE are informed by the late Joseph Sabine, Esq., in a communication published in the Transactions of the London Horticultural Society, vol. v. p. 439, that the cultivation of tropical fruit was one of the subjects to which it was purposed, on the first establishment of the Society, that its attention should be directed, and that the various collectors employed in its service were particularly instructed to attend to the discovery of new fruits, and to embrace every opportunity of procuring the most accurate information in regard to their cultivation. How far this Society has succeeded in enlightening our darkness on this subject is not for us at present to inquire into. Some private individuals, however, have turned their attention to this subject, and an epitome of the success of their endeavours will occupy a part, in conjunction with our own practice and observations, in the following remarks on the subject of Tropical Fruit culture.

For such as have the means, and a taste, for the cultivation of Tropical Fruits, we would recommend a trial, as being both useful and agreeable. "It seems," says Mr. Loudon, in speaking on this subject, "to deserve the attention of retired persons of solitary habits, aged or inactive, by presenting an end to be attained: it may serve as a gentle stimulus to such as, from indolence or bilious complaints, are apt to sink into a state of torpid, unenjoyed existence."

The natural habits of the pine, when first introduced into this country, and recommended as a fruit-bearing plant, were much less known than the habits of most Tropical Fruits are at present, and the science of artificial gardening was much less perfectly understood at that time than it is at present. Yet we know what progress has been made in the culture of that fruit, also a native of the tropics, within the space of less than a century, and it would not surprise us to see, in less than a quarter of that time, the Mango, the Mangostein, the Plantain, the Banana, and the various Guavas, as common in the markets of the British metropolis, as the Pine and the Melon are at present.

Some of the fruits of the tropics have already fruited with us without much difficulty, such as, for example, the mango, at Walcot Hall, by the Earl of Powis; the guava, by the late Mr. Cattley; the jambrosade, by Professor Thouin, in the Jardin des Plantes at Paris; the banana, by Mr. Richardson, at Walton-on-Thames, and in many other places, and the granadilles, in almost every stove where their culture has been attended to.

In announcing to the Horticultural Society the success of the Earl of Powis in fruiting the mango, Mr. Sabine observes, "It is with great satisfaction that I have to address the society upon the subject of the mangoes which have lately been communicated to us by the Earl of Powis. Thus having succeeded in showing that this delicious fruit may be produced under artificial management in Great Britain, and in sufficient abundance to form a not unfrequent part of the dessert, is so important a circumstance, that I feel called upon to acquaint the public as speedily as possible with the result of this very signal triumph of skill and perseverance over difficulties which have been hitherto considered insurmountable."—*Hort. Trans.* vol. vi. p. 550. The same success we hesitate not to predict will follow the intelligent and scientific cultivator in the case of most of the Tropical Fruits enumerated and treated of in the following pages.

#### STRUCTURES CALCULATED FOR THE CULTIVATION OF TROPICAL FRUITS.

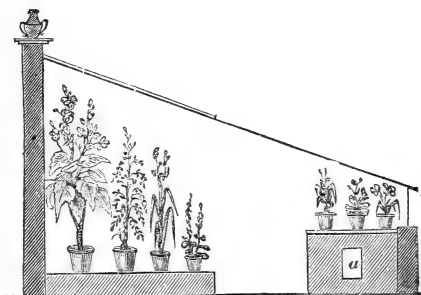
Light, heat, and moisture, are indispensable agents in the creation of a proper atmosphere for the culture of Tropical Fruit trees. These can be commanded in abundance by the ordinary means in daily use. The structure for this purpose would require to be of large dimensions, particularly in altitude, as some of the trees attain a considerable height, such as the bananas, plantains, &c. There are others, however, which can only be considered as mere shrubs, as the Indian fig, prickly pear, &c.

A span-roofed house, therefore, is certainly the most eligible for this purpose, as the centre will afford space for the tallest growing sorts, while those of humbler stature can occupy the front or sides, where they will enjoy a sufficiency of light without shading their taller neighbours. Such a house as that represented by our figure of a double span-roofed conservatory (which see) is all that would be required for this purpose, even upon the most extensive scale; and in such a one the plants might be planted out in the borders, but much better if grown in large boxes or pots, and sunk into a cavity under the surface level. By adopting the

latter plan, great economy would be effected, for the arrangements could be so contrived that the plants might be elevated or lowered according to circumstances, and thus the expense saved of carrying up the roof to an extraordinary height, which should be avoided as much as possible, not only on account of the extra expense in the first erection, but also in the great expenditure of heat ever after.

This mode of arrangement has been exemplified in the new houses recently built in the Jardin des Plantes, at Paris. The space where the tubs and pots stand is sunk six feet under the ground level, which is tantamount to adding the same to the height, besides the improvement in the appearance. In this cavity the plants should be placed on stands, by which they could be elevated or lowered at pleasure. There can be no objection to this mode of arrangement, provided that a sufficient temperature be kept up at and round the roots of the plants, and that a sufficient degree of ventilation be afforded: without these precautions the plant would not flourish. This can, however, be very easily effected by making the arrangements for heating sufficiently low, so that the bottom of the pit or cavity may be heated first.

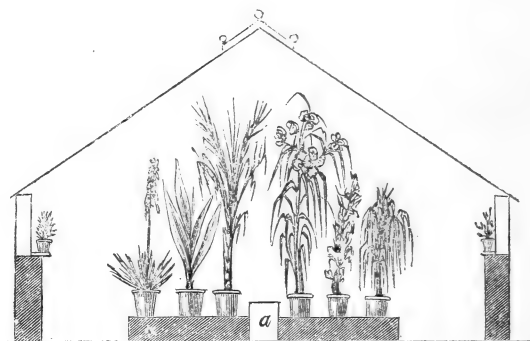
Upon a smaller scale many of the lower growing Tropical Fruits may be cultivated in houses not very materially different from those in general use; and, perhaps, the most economical of all might be such as is represented by the accompanying diagram, and in which many of these fruits might be grown.



Such a house, if not exceeding thirty or thirty-five feet in length, might be heated by one flue, or hot-water pipe, placed at *a*, over which a trellised table should be placed for the reception of young plants, to replace such

as may die, or require to be removed in course of time. The fruit-bearing plants or trees should be set on or plunged in a bed of tan, or leaves, or other fermentable matter; this pit to be of the depth of not less than eight or nine feet, both for the purpose of affording a powerful bottom heat to such plants as most require it, and to enable the cultivator to sink the plants as it may appear requisite, or when they press too much upon the glass.

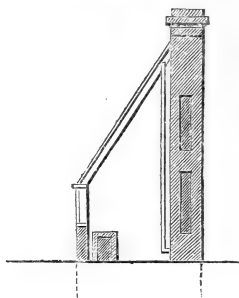
A small span-roofed house might be used for a similar purpose, and one according to the principle of the accompanying sketch might be con-



sidered as a good example. In this house, the pit will occupy the centre, and be of an equal depth to that proposed above, but having piers carried up under the centre of the roof, as at *a*, upon which cast-iron pillars may rest, at equal distances, for the support of the roof, and also to carry the pipes for the hot water, which might be placed just above the level of the bed.

This mode of heating may be objected to by some, because the pipes are placed in the centre of the house instead of towards the sides, which is unquestionably the best position for repelling the cold. Our object is, that as there are some Tropical fruit-bearing trees that require a greater degree of heat than others, and as these are in general the largest or loftiest growing ones, they of course occupy the centre or warmer part of the house, as the heat will be given off from the pipes by radiation, to the right hand as well as to the left, and also in a perpendicular direction.

A house upon the principle shown in the annexed diagram would also be a very eligible structure for fruiting Tropical trees : it might be about five feet wide, and as high as the garden wall against which it is placed. The trees should be planted out against the back wall, and trained horizontally or fan-shaped, according to circumstances ; by this means the most lofty trees could be so trained as to occupy little space, and the control of training would tend to bring them into a bearing state much sooner. This house may be heated by hot water or flues placed in front, upon a solid foundation, to prevent their sinking as well as to limit the space for the roots to run in. The lights may be fixed and ventilation carried on by the use of wooden ventilators, built in the front and back walls.



In such houses much might be done in attaining the end in view. We will now proceed to notice some peculiarities in the culture of different species.

#### THE AKEE TREE (*Blighia sapida*).

This tree is a native of Guinea, and was introduced into this country in the year 1793. It is very commonly met with in collections of stove plants. It attains a height of from twenty to twenty-five feet, in its natural state, but is seldom half so much when cultivated in this country. The fruit, which is about the size of a goose's egg, and of a reddish yellow colour, is esteemed by the West Indians as a wholesome and nourishing food.

This tree is propagated by seeds, cuttings, layers, &c., like most other stove plants, but the British cultivator who means to attempt its cultivation as a fruit-bearing tree, had better order a few trees to be inoculated in Jamaica, and then sent over in tubs ; these might be treated as directed for orange trees, and then planted in a border of rich earth, submitted to a Jamaica climate, and flat-trained near the glass. The Akee, treated in this manner, or kept in tubs or large pots, would, there is no doubt, produce fruit with us as freely as the orange or citron does.

#### THE ALIGATOR, OR AVOCADO PEAR (*Laurus persica*).

This tree, like most of its family, does not often exceed the height of thirty feet in its natural state, and much less when submitted to cultiva-

tion. The flowers are produced towards the points of the branches, care, therefore, should be taken that they be as seldom shortened as possible. The fruit is about the size of a small pear, having a rich and delicate flavour, and, unlike exotic fruits in general, very soon gaining on the palate of Europeans, who become as partial to it as the West Indians themselves, who esteem it one of their best fruits. It is in general eaten with lime-juice, wine, or pepper and salt, as melons are by some connoisseurs in this country.

The remarks we have made on the propagation, importation, and culture of the Akee tree are equally applicable to this also.

#### ANCHOVY PEAR (*Grias cauliflora*).

In its natural state this tree attains the height of fifty feet and upwards, requiring, therefore, in a state of artificial culture, a house as lofty as the Musas, &c. The medium height at which it might be expected to produce its fruit in this country, may be taken at from twenty-five to thirty feet. It is a native of the West Indies, producing a fruit somewhat similar to the last, both in size and shape. It is used more as a pickle than in its natural state, and, in the former, resembles in taste the East Indian Mango.

It is propagated readily from seeds, and also by the other usual modes, and, like all lofty-growing exotic fruits, might be more advantageously trained to a trellis, in a horizontal manner, than grown as a standard, requiring, of course, a less lofty house.

#### AFRICAN CUSTARD APPLE (*Anona senegalensis*).

This is a native of Senegal, Sierra Leone, and the banks of the Congo. It attains, naturally, a height of about twelve or fifteen feet, and produces fruit about the size of a pigeon's egg, which in flavour resembles that of the other custard apples (which see), but is superior to most of them.

#### BARBADOES GOOSEBERRY (*Pereskia aculeata*).

This well-known plant, if allowed room to extend its branches, trained under the rafters of a stove, and planted in a large pot, in rich, well-drained soil, will produce its fruit abundantly. It is, however, less esteemed in point of flavour than most of the other Cactuses, which see under the name *Indian Fig*, &c.

BASTARD GUAVA (*Eugenia pseudo-Psidium*), CAYENNE CHERRY (*Eugenia cotinifolia*), CATTLEY'S GUAVA (*Psidium Cattleianum*), THE RED GUAVA, (*Psidium pomiferum*), THE WHITE GUAVA, (*Psidium pyri-ferum*)—

Are all fruits of considerable merit, and are held in high esteem in their native country. As these trees do not attain a very large size before they produce their fruit, perhaps from ten to fifteen feet, they are better calculated for house culture than those which require more room. The fruit of the white or wild guava is of a roundish, oblong form, and rather larger than a hen's egg. Its flavour is sweet, aromatic, and pleasant. The red guava somewhat resembles a pomegranate in size and colour; it is not of so pleasant a flavour as the last. The fruit of Cattley's guava is nearly spherical, and larger than any of the above; its colour is a fine claret; it is juicy and pleasant, and of the consistency of a strawberry.

The latter sort has been fruited often in this country without any particular trouble, in a common plant stove, and there is no doubt but the rest might be cultivated so as to produce abundance of fruit.

The *Psidium Cattleianum* is fruited at Snelston Hall, by Mr. Smith, most successfully, by confining its roots in pots or tubs when they have attained their full size. This brings on a disposition to flower and produce fruit, which is ripened into full maturity by removing the trees from the greenhouse or conservatory, into the stove or forcing-house, in autumn, when the temperature is not less than sixty degrees. The guava flourishes best in a strong, rich, loamy soil, abundantly supplied with water, both at its roots and over the branches. It becomes under this treatment a very desirable addition to the dessert during winter; and trees of only four feet in height have been loaded with not less than ten dozen of fruit, in their different stages of growth.

THE BREAD FRUIT (*Atrocarpus incisa*), THE JACK FRUIT (*Atrocarpus integrifolia*).

Neither of these has produced fruit in Europe, nor are they by any means common, even in collections strictly botanical. Their culture seems by no means so well understood, as even to admit of their being found often amongst the plants of commerce. These remarks are more directly applied to the former, which is a native of the South Sea Islands,

from whence, after much trouble and expense, it was introduced into the West Indian islands, where it was expected to turn out of good account as a nutritious food for the black population. The latter tree is plentiful in the West Indies, and produces abundance of fruit, and is altogether much more patient of cultivation. The fruit of the true bread-fruit tree is about the size and shape of a child's head, and curiously reticulated on the exterior, somewhat like a truffle. The skin is thin, between which and the core, (which latter is about the size of one's finger) lies the pulp or edible part, which is pure white, and of much the appearance and consistency of new bread. It requires to be baked or roasted before it is eaten, and its taste resembles that of new bread mixed with Jerusalem artichokes.

We are surprised that these extraordinary trees should remain so rare in Britain, when it is well known that both sorts might be imported, with little trouble or expense, from St. Vincent's or Jamaica. We wish some spirited amateur cultivator would introduce some of both kinds, and give them a fair trial in a house dedicated to the production of Tropical Fruits.

We are informed that the largest specimen of *Atrocarpus incisa* in Britain is in the Chatsworth collection. In such establishments only are we to expect to see this extraordinary fruit brought to perfection.

It is probable that neither of these will ever produce their fruit in this country, as they attain a large size and considerable age before they fruit even in the tropics. They would, however, be highly ornamental, on account of their fine foliage, and, in a collection of Tropical Fruit trees, quite indispensable.

#### THE EARTH NUT (*Arachis hypogæa*).

This plant is cultivated extensively in South Carolina, where the seeds are used as chocolate. In the neighbourhood of Paris it is raised on hotbeds, and afterwards transplanted into the open garden, where it ripens its seeds, which are used as other legumes. It has been cultivated in the gardens of the Hon. Robert Fulke Greville, by sowing the seeds singly in pots about the month of February in a pine stove; when the plants have attained the height of half a foot they are turned out of the pots and planted in the tan bed, in a row, close to the kerb, where they form a pretty edging, and do not attain a height to shade or interfere with the pines. The pods ripen in autumn, when they are taken out of the tan and dried, and are found to be as good as those grown in the tropics.



THE PLANTAIN TREE (*Musa paradisiaca*), THE BANANA TREE (*Musa sapientum*), THE DUKE OF DEVONSHIRE'S PLANTAIN (*Musa Cavendishii*).

These plants attain the height of from fifteen to twenty feet of stem in a natural state, with leaves often more than six feet long and two broad. In a cultivated state, however, they produce their fruit when of the height of from eight to twelve feet. The flowers are produced at the termination of the stem, which, therefore, must on no account be shortened, but allowed to extend to its full length. The flowers hang in long racemes, or bunches, the fertile ones occupying the lower, and the barren ones the upper part of the raceme. The fruit is a long, angular, fleshy berry, very sweet and pleasant to eat. In the tropics, the spikes of fruit often exceed the weight of forty pounds, but so far as we are aware they have not been produced in our hothouses above half that weight.

"It is certainly one of the most useful fruits in the world, and seems to have migrated with mankind into all the climates into which it may be cultivated. The fruit is so much esteemed by all Europeans who settle in America, that the first thing they do is to establish a plantain walk; enlarging it as their family increases. Some or other of the trees are bearing most part of the year; and their fruit is often the whole food on which a family subsists. Three dozen plantains are sufficient to serve one man for a week, instead of bread, and will support him much better." —*Ency. of Plants.*

The fruit of the banana is shorter and rounder, and rather more luscious in taste than the plantain: it can only be considered as a variety of the other, although botanists have described them as separate species, with about as much reason as there would be in making the golden pippin and the golden nob apple two distinct species of pyrus.

Both varieties have been fruited in this country, particularly at Wynn-stay, the seat of Sir Watkin Williams Wynne, in Denbighshire, whence specimens of the banana between four and five inches long were forwarded to the Horticultural Society of London, in 1819. The plant above alluded to is described in the *Transactions of the Society*, vol. vi. p. 138, as being planted in the pit of a stove when about six feet high, with a single stem.

"In each succeeding year it has produced a bunch of fruit: but in the present year (1819), two bunches: the first was ripe in May, the other in August, having about four dozen fruit on each bunch. The plant is now sixteen feet high, and measures three feet round at the bottom."

In regard to culture, no plant requires less, provided they have room to develope their beautiful and delicate foliage. To afford them this, and also as their roots are long, thick, and fleshy, they had better be planted out in the border of the house in rich, loamy soil, laid upon a perfectly dry, well-drained bottom.

The *Musa Cavendishii* is a variety, probably a new species, lately discovered, and named in compliment to his Grace the Duke of Devonshire, who is the most munificent patron and liberal encourager of horticulture and botany of the day. The great merits of this latter sort is, that it is of humble growth compared to its near associates, and is capable on that account of being cultivated in pine pits with as much success and certainty as the Ananas or pine-apple. It is, however, still rare, the demand for it being more than the supply has hitherto been able to meet.

HOG PLUM, OR YELLOW PLUM (*Spondias myrobalanus*), GINGERBREAD PLUM (*Parinarium macrophyllum*), COUNTRY PLUM (*Spondias*, various species), SMALL PIGEON PLUM (*Chrysobalanus ellipticus*) YELLOW PIGEON PLUM (*Chrysobalanus luteum*), ROUGH SKINNED, OR GREY PLUM (*Parinarium excelsum*), BLACK PLUM (*Vitex umbrosa*).

These are chiefly natives of Sierra Leone. The first produces its fruit at the extremity of the branches: it is of the size of a walnut, of an oval shape and yellowish colour; the flesh is tender, and in taste and appearance much resembling the plums of our gardens.

The second is a shrub of only a few feet in height, producing fruit about the size of our Orleans plums, which is very well tasted.

The two varieties of pigeon plums are esteemed for their fruit, but the latter species has not, we believe, been introduced as yet into this country. The trees on which both are produced are of no great magnitude, and from that circumstance, and the profusion in which their fruit is produced, there can be little doubt but that it could be cultivated in great perfection in our stoves. The fruit of the small kind is in size and colour similar to our damson, and that of the yellowish sort is similar in all respects, except colour, to our Orleans plum.

The rough-skinned, or grey plum, is the least interesting as a fruit of any of the others. It is, however, much esteemed by the natives, and by them brought in great quantities to the markets. In size and shape it resembles our Imperatrice plum, but is of a greyish colour.

The black plum is the produce of a large and elegant tree, not unlike the horse chestnut: the fruit is produced in abundance, but is not so

much esteemed as the pigeon plums, noticed above. The culture of a common plant stove would be suitable for all of these, giving them plenty of pot room, light, heat, and water.

## GRANADILLA OR GRANADILLE,

Is a name given by the French to several sorts of passifloras, from the resemblance of the fruit, in size and colour, to a pomegranate, with this difference, that the granadilla is not crowned with a calyx. Those most commonly cultivated for their fruit are, the common granadilla (*Passiflora quadrangularis*), apple-fruited granadilla, or sweet calabash (*Passiflora maliformis*), laurel-leaved granadilla, or water lemon (*Passiflora laurifolia*), purple-fruited granadilla (*Passiflora incarnata, edulis* of Bot. Mag.), flesh-coloured granadilla (*Passiflora incarnata* of Linnæus).

These have all fruited in the stoves of this country, and in a house set apart for the cultivation of tropical fruits, they should be planted out in borders, or grown in large pots or tubs, and trained up the rafters.

The common granadilla bears fruit of an oblong form, about six inches in diameter and fifteen in circumference. The flavour is sweet and slightly acid, very grateful to the taste, and extremely refreshing in a hot climate, where it is usually eaten with wine and sugar.

Mr. Micheson, in a communication in the *Gardener's Magazine*, vol. ii. p. 203, details his mode of culture as follows:—"The plant is set into a box eighteen inches square, fixed on a level with the kerb in one corner of a tan pit. The sides of the box are perforated, to admit the roots to run among the tan, and the shoots are trained like vines under the rafters. In autumn the shoots are pruned back to within two or three eyes of the old wood: and in the March following, just before the plant begins to break, it is taken out of the box, the root and ball reduced, and re-potted in fresh compost. Abundance of water in the following season enables the plant to set its fruit without the aid of artificial impregnation. A strong plant will produce forty fruit in a season in regular succession, from the end of June till Christmas."

The laurel-leaved granadilla, the *pomme de liane* of the French, or the *murueija* of the South Americans, is most extensively cultivated in the tropics, being agreeable to most palates. It has often fruited in the stoves of this country, treated like any other stove climbing plant. The same treatment as recommended for the last will also be suitable to this species.

The purple-fruited granadilla (*Passiflora edulis* of some authors, *P.*

*incarnata* of others) produces immense quantities of fruit, which is about as large as a hen's egg, and much of the same shape; green at first, but when ripe of a beautiful plum-colour. It is a native of the Brazils, and was introduced to England from Portugal in 1810. Such is the rapid growth of this species, that a plant has been known to extend in one season over forty feet of glass, and on the same space produce from four to five hundred fruit.

All the edible species of *Passiflora* will produce their fruit very well in large pots; "but it is best to plant them in an angle of a stove, which has been parted off, either by boards or brickwork, as low as the pit goes. At the bottom of the cavity formed by this division should be laid some brick rubbish, over which may be thrown a little dead tan, and the whole be then filled with equal parts of very old tan, and a compost of leaf-mould and very rotten dung, wherein the roots will strike freely, and will even spread through the partition into the pit. They do not require the full heat of a pine stove, for they flourish best in a temperature of from sixty-five to seventy degrees; but they will not bring their fruit to perfection if kept in a common greenhouse or conservatory, though they will grow and flower in it. The shoots as they advance may be trained near to and under the inclined glass of the stove; the first flowers will appear in May, and the blooming will continue to September, the fruit setting the whole time: but if it does not set well it will be advisable to impregnate stigmas, by applying the pollen with a feather. As they grow, the very strong shoots should be cut out from their origin, for these do not bear fruit so abundantly as those which are less vigorous; and the fruiting branches must not be shortened on any account. The temperature must be kept up equally during the time of flowering and fruiting; the crop will begin to come in in August, and will continue until January, but the earlier produce is the best. When the crop is all off, which will be early in January, the heat must be reduced to about fifty degrees, so as to check and stop the growth. This being effected, the shoots must be well cut in. As little old wood as possible, besides the main stem, which rises from the pit to the glass, and a few pieces (about two or three feet of each) of the old branches, should be retained; for all that is to be trained under the glass to bear in each year, ought to be the growth of two years' standing. In this dormant and reduced state it is to be kept during January and February, after which the necessary heat may be applied to cause it to resume its functions for the ensuing season."—*Sabine, in Hort. Trans.*

LARGE FIG OF SIERRA LEONE (*Ficus Brassii*), SMALL FIG OF SIERRA LEONE (*Ficus* sp. ?), INDIAN FIG (*Opuntia Ficus indica*, *O. vulgaris*, and other species).

The two former are natives of Sierra Leone, as their name implies, and are held in high esteem both for the good quality of the fruit and the abundance with which it is produced. The fruit of *Ficus Brassii*, a well-known plant in our stoves, is about the size of our white Ischia fig. The tree is of moderate growth, and produces its fruit abundantly on the old wood.

The Indian fig is a name by which several species of *Opuntia* are known in the tropics, particularly such as are fruit-bearing. They are considered as wholesome, and although the taste be not very agreeable to most Europeans at first, after they have eaten of them several times they generally become very fond of them. *Opuntia vulgaris*, as well as *O. Ficus indica*, have been both fruited in the open air in this country, and the former in a stove so early as 1750, in Scotland, by Justice.

To fruit these plants with certainty will require a temperature of from fifty to fifty-five degrees during winter, and increased to eighty or ninety degrees during summer, excepting for *O. vulgaris*, which has been fruited in the open air by the late Braddick and others, and has stood as a hardy plant in front of an old greenhouse in the Addelston nursery for three-fourths of a century.

A rich, well-drained soil, with a mixture of gritty matter, is the most proper for them, and pots of a large size are better than planting them out in the borders of the house.

#### THE DURION (*Durio zebethinus*).

This tree, which is a native of the East Indies, was only partially introduced into the European gardens in 1825. We notice it here with the view that some intelligent horticulturist may be induced to obtain plants of it, which we believe may be had of the Messrs. Loddiges, or the Horticultural Society. Those having communication with the Calcutta garden would find no difficulty in procuring it from that source. Rumphius says it is by much the most excellent fruit of India. We presume that by the same mode of culture which is practised in the case of other rare tropical fruit trees, particularly if grown in a house expressly set apart for the purpose, this fruit might be produced in tolerable perfection.

COCOA-NUT TREE (*Cocos nucifera*).

This magnificent East Indian palm grows to a great height in its native country. It is by no means rare in botanical collections in Europe, nor are its uses and history unfamiliar. The following is the mode of culture recommended in the *Ency. of Gard.*, as the most likely to induce it to produce its fruit in this country:—"The nuts are to be planted where they are designed to remain, as the tree will not bear transplanting unless very young. In a moist heat they will push in six weeks or two months. To cultivate for fruit, plant in the centre of the area of a house, twenty-five feet wide, and either lofty or with a moveable roof, which will admit of being raised as the tree advances in height. In this way, with a strong heat, there can be no doubt this tree would produce fruit in England; but even if it did not, or did not for a great many years, the magnificence of its appearance, under such a mode of treatment, would compensate a curious horticulturist for the labour and expense. Though the cocoa-nuts to be obtained in shops are supposed to be gathered before they are ripe, yet they have been found to grow with no other care than planting in a large pot or box in rich earth, and plunging in a bark bed.

It may be observed here that this is almost the only palm that could be cultivated in this country for perfecting its fruit: for the others being dioecious plants, unless a great number were grown together, there would be no legitimate means of impregnating the female blossom."—(See PALM STOVE.)

THE JAMROSADE, OR ROSE APPLE (*Eugenia jambos*).

This is a well-known inhabitant of our stoves, and was cultivated so early as 1768 by the celebrated Phillip Miller. It is a native of the East Indies, and attains the height of from twenty to thirty feet. The fruit is about as large as a hen's egg, and rose-scented, in flavour much resembling a ripe apricot. It appears that there are several varieties of this fruit, differing in size and colour—a circumstance easily imagined, as we find it to be the case in most fruits that are esteemed or have been long cultivated, particularly from seeds, as by that means new varieties are perpetually originating, as may be instanced in the case of the apple, pear, and our other domestic fruits. The late Professor Thouin, of the Jardin des Plantes, at Paris, cultivated a white variety very successfully for several years. By his experiments it would appear that the plants require a high temperature and moist atmosphere, for all his endeavours to harden them by exposure, even during summer, failed.

COUNTRY GRAPES (*Vitis cæsia*).

A native of Sierra Leone, a half-shrubby climber : the fruit is produced in small bunches, and is round, black, of a rather acid, not over-pleasant taste. It produces immense crops of fruit, and could be cultivated successfully in a Tropical Fruit house in this country.

COUNTRY CURRANTS (*Antidesma* sp. ?)

A native also of Sierra Leone, producing plenty of fruit upon small bushes, and of very easy culture.

MONKEY APPLE (*Anisophylla Laurina*).

A native of Congo and Sierra Leone. It attains the height of forty or fifty feet naturally, but would of course by cultivation produce fruit at a much less height. The fruit in size and form resembles a pigeon's egg, red on the sunny side, and yellow on that which is most shaded ; the flavour is something between that of a nectarine and a plum.

MALAY APPLE (*Eugenia malaccensis*).

A native of the South Sea Islands, resembling in general appearance the Jamrosade, or rose apple. The fruit is about an inch and a half in diameter, fleshy, sweet-smelling, and agreeable both to the taste and sight, as well as wholesome and nutritious. Its cultivation is not different from that of other tropical *Eugenias*, many species of which are inhabitants of our plant stoves.

COFFEE TREE (*Coffea arabica*).

Arabia is generally supposed to have been the native region of this tree, although some naturalists have adduced reasons to show that it might have passed into that country from Persia, whose inhabitants are supposed to have received it from Ethiopia, where it has been in use from time immemorial. "The migration of the coffee shrub from Arabia to the tropical regions of the West, was effected circuitously by way of Europe. About the year 1690, the then governor of Batavia, Van Hoorn, procured some berries of the coffee tree from Mocha, in Arabia Felix, and raised many plants in the island of Java, whence he sent one to Nicholas Witsen, a burgomaster of Amsterdam, and the governor of the

Dutch East Indian Company. This plant arrived in a healthy condition, and was placed in the botanical gardens of Amsterdam, where, by careful management, it was made to bear seeds, and in the course of a few years many young plants were raised from its produce.

"Many years elapsed, however, ere the progeny of the Amsterdam plant was conveyed to a more congenial climate, and where it could be rendered practically useful. It was not till the year 1718, that the colonists of Surinam began to form coffee plantations, and nearly ten years more had passed before the plant was conveyed by the French to their colony in Martinico. The advantages attending the cultivation were now, however, become so manifest, that it quickly spread through the neighbouring islands. In 1728, Sir Nicholas Laws first introduced the coffee plant into Jamaica, where it was cultivated on the estate since called Temple Hall, in Laguanea. In four years after that period it had already proved itself of sufficient importance to command the attention of the legislature of that island, and an act of council and assembly was passed to encourage its growth.

"The annual consumption of coffee in Europe has been estimated to amount to 110,500 tons, of which it is calculated that 10,000 tons are consumed in Britain alone."—*Tropical Agriculturist*.

The culture of the coffee as a plant of ornament is exceedingly simple, and where there is room to spare for them in a large garden, a considerable supply may be obtained from half-a-dozen trees. At one period of our practice we had twenty-four of these trees in a full bearing state, and annually procured from them several pounds weight of berries, which when roasted and ground in the usual manner produced to the proprietor very excellent coffee of his own growth. These trees, for want of better accommodation, were grown in a large vinery from February till October, and required little other attention than that of a liberal supply of water. From the latter end of October till February they are placed in a pine stove, as they are very impatient of cold. The fragrance of their blossom, and the beautiful red appearance of the ripe fruit, with successive crops of berries in various stages of growth, had a very good effect. They are propagated most readily from seeds, which will vegetate and grow rapidly, and plants three years old under good management will produce fruit, and continue for many years.

#### THE LOQUAT (*Mespilus japonica*).

This is a native of Japan, which has been long an inhabitant of our greenhouses, and indeed has in many instances been found to succeed in



the open air trained against a wall. The fruit is about the size of a large gooseberry, and much like the apple in flavour. The Loquat has produced fruit in the gardens of Lord Bagot, in Staffordshire, who gives the following outline of its culture :—"The plan I have usually followed," says his lordship, "has been to give it a winter, (out of doors) during the months of July, August, and September, and about the middle of October to replace it in a very warm situation in the tan. This summer, however, I was obliged to alter my mode, for just at the moment when I was going to put it out for its winter, it became covered with at least twenty of the finest flowers possible ; I was, therefore, obliged to let it remain where it was. The present year's treatment, therefore, is an exception to the former practice ; under that, it usually breaks into flower about the end of December, and the fruit becomes ripe in March and April."

#### THE MANGOSTAN (*Garcinia mangostana*).

This splendid tree is a native of the Molucca islands, attaining the height of about twenty feet. It has been introduced, and is successfully cultivated, in Java and Malacca, where it is much esteemed. Dr. Garcin, after whom the genus was named, describes it as the most delicious of all the East Indian fruits, and says that a great quantity of it may be eaten without inconvenience, and recommends it as the only fruit that sick people may eat of without scruple.

The fruit is round, about the size of an ordinary orange, of a delicious flavour, partaking of the strawberry and the grape. They are propagated by the usual modes, viz., seeds and cuttings. Seeds, however, soon lose their vegetative properties, and are with difficulty imported in a sound state: cuttings are readily rooted, and soon make strong plants. It has been long known in this country, and is noticed by Miller, who gives the following as the outline of its culture :—"Sow the seeds in tubs of earth in their native country, and when the plants have obtained strength, they may be brought to Europe ; but there should be great care taken to screen them from salt water in their passage, as also not to give them too much water when in a cool or temperate climate. When the plants arrive in Europe they should be carefully transplanted, each into a pot filled with light kitchen garden mould, and plunged in the tan bed, and shaded from the sun till they have taken fresh root ; then treat them as suggested for other stove plants."

MONKEY BREAD (*Adansonia digitata*).

This tree, of the enormous size of which such wonderful accounts have been reported, was not found by Mr. Don, in his journey to Sierra Leone, to exceed that of a large apple tree. In regard to its fruit we may observe, that it is of considerable size, containing a farinaceous pulp full of seeds, tasting something like gingerbread, but with a pleasant acid flavour. It is pretty common in the stoves in this country, and is found to be so easily cultivated that any particular notice of it would be superfluous.

SWEET PISHAMIN (*Carpodinus dulcis*).

This new genus of plants was established by the learned and amiable Robert Brown, Esq., in whose herbarium specimens of it exist; but we believe that, although observed by Mr. Don growing plentifully on the Martello-tower Hill, near Tree Town, Sierra Leone, and by other collectors, it has not as yet reached us in a living state. Were its merits as a fruit-bearing tree sufficiently known, we doubt not but that it would soon find its way to this country.

It is described by Mr. Don as a climbing shrub, producing fruit resembling the lime, and growing pendulous either singly or in pairs. The pulp is agreeable and sweet, and when broken yields a quantity of sweet milky juice. There is another species, which produces fruit more abundantly than this, but much less agreeable to the taste.

THE MANGO (*Mangifera indica*.)

This fruit is a native of the East Indies, but has been long ago introduced and successfully cultivated in most of the West Indian islands, particularly in Jamaica, where several varieties of greater or less merit are cultivated. The late Sir Stamford Raffles assures us that there are above forty varieties of mango known in Java alone.

The fruit is described as a kidney-shaped drupe, or berry, covered with a smooth, resinous, pale yellowish, or half-red skin, containing an oval, compressed stone, within which is a soft and pulpy kernel. It is considered wholesome, and is exceeded in point of flavour by no other Tropical fruit, the pine-apple only excepted. Two varieties of the mango have been fruited in this country by the Earl of Powis, which, in honour of his

lordship, have been named the Red and Yellow Powis Mangoes, of which the following notice has been published in the *Hort. Trans.* vol. vi. p. 551: "The red Powis mango was ripened in the garden at Walcot, in the beginning of September; and the tree which bore it produced at the same time thirty-five other fruit, of unequal size, but of equal excellence in flavour. In form it resembled a compressed oval, with one end a little curved inwards; the skin was of a rich olive colour, becoming green towards the apex, and being deeply stained on the exposed side with bright crimson, breaking into spots of a darker colour. The flesh was deep yellow, filled with an abundant juice, very tender, but fibrous next the stone, from which it was inseparable. The flavour was sweet, rather luscious, highly perfumed, with a decided taste of turpentine, but diffused in a most admirable proportion, so as to produce a very agreeable and novel effect upon the palate. This resinous taste was more concentrated in the skin, in which it was combined with a slight proportion of acid.

"Of the yellow Powis mango, one fruit only was produced, which ripened in the beginning of October. The skin was of a pale, dull, yellow-ochre colour, a little brighter and more orange-coloured towards the stalk, and covered over, when minutely examined, with numerous paler specks. When fresh gathered it was covered with a delicate bloom, which it did not wholly lose after having been kept nearly a fortnight. It did not appear to differ much in taste from the first; perhaps was a little more luscious, and also in a slight degree more fibrous.

"It does not appear that the management under which these mangoes were ripened possesses much peculiarity. The plants are in pots, plunged in the tan pit of a good stove, which is maintained at a temperature of from seventy to ninety-six degrees, by means of a particular application of hot water. Lord Powis conceives that it is this mode of heating which has mainly contributed to force the plants to produce their fruit." We are rather surprised at the weakness of the concluding conjecture, knowing that heat is the same powerful agent, whether generated and diffused by smoke-flues, steam, or hot water.

The mango is easily propagated by cuttings, and there can be no doubt but that it might be produced in great abundance in a Tropical Fruit house, or even in an ordinary stove. The principal point is to procure good varieties, as many of them are, like some of our apples and pears, hardly worth cultivating. Good varieties can be obtained from Jamaica. We once had a mango tree presented to us by a gentleman who had it dug up out of his garden in Jamaica, and transported to England, because he was certain of the excellent quality of the sort; but it was

unfortunately lost, two years after its introduction, through circumstances over which we had no control.

#### THE CHOCOLATE TREE (*Theobroma Cacao*).

The Cacao tree is extensively cultivated in many of the settlements in Spanish America, particularly in Mexico, where it has been raised for an unknown length of time. The cacao tree is thus described in *The Library of Entertaining Knowledge*:—"It seldom rises above the height of twenty feet; its leaves are large, oblong, and pointed. The flowers, which are small, and of a pale red colour, spring from the large branches; they are succeeded by oval pointed pods, that contain a white pithy substance, which is sweet, but disagreeable, and surrounding numerous seeds: these are the cacao of commerce."

The *Theobroma* is increased by seeds, and also by cuttings, and requires only the culture of a well-regulated stove to grow it to perfection. In its native country it requires the growth of six or seven years from seed to attain a fruitful state; therefore, under the influence of artificial culture we may naturally conclude that a tree, enjoying good health and proper treatment, will not produce fruit under that period, if so soon.

#### THE SUGAR-CANE (*Saccharum officinarum*.)

The sugar-cane, although not a fruit-bearing tree, is of sufficient importance to demand a place in a stove dedicated to the cultivation of Tropical Plants, as the produce of it is interesting to us, as ministering so largely to our comforts and luxuries.

The sugar-cane has been cultivated in our stoves since 1597, and, consequently, is one of their oldest inhabitants. It is of easy culture, requiring plenty of heat, and a moist, rich soil. With us it attains the height of seven or eight feet, but never flowers. During the short period that the Empress Josephine enjoyed the title of wife to the most capricious of men, the sugar-cane was grown upon a pretty extensive scale in the royal gardens at Paris, and from the produce of the canes so cultivated a small sugar-loaf was made and presented to the Empress, who, it is well known, was a most enthusiastic promoter of horticulture and botany.

#### TAMARIND TREE (*Tamarindus indicus*).

The tamarind tree has been long an inhabitant of our stoves and

greenhouses; it has not, however, that we are aware of, yet produced fruit in the gardens of Europe.

This tree is a native of the East and West Indies, and also of Arabia and Egypt. The pods produced on the West Indian trees are from two to five inches long, and contain two, three, or four seeds; the East Indian ones are twice as long, and contain nearly double the number of seeds. The crop of pods is usually ripe in the West Indies about June, July, and August; they are then gathered, and when cleared of the shelly fragments, are placed in casks, in regular and compact layers, over which boiling syrup of sugar is poured, to fill up all cavities: they are then fit for exportation. The East Indian tamarinds are said to be preserved without sugar. The boiling syrup appears to have little effect upon their vegetative functions, for we have frequently obtained plenty of young plants from the seeds taken out of the tamarinds in their preserved state. It might be worth the trial to see how far the seeds of other Tropical Plants might be safely imported by being packed in a similar manner.

The tamarind tree is of very easy culture, requiring only the temperature of the stove, and a loam and peat soil. It was remarked by Miller, that although he had several plants of twenty years' growth, they had shown no disposition to produce their flowers, and we believe this has been universally the case.

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#### TROPICAL SPICES.

It is not less singular than true, that the plants which produce the most esteemed spices are all natives of the tropics, and also that not one of them has been found to produce its fruit in the open air of Britain. The use of spices is of the highest antiquity, and Frankincense and Myrrh are names handed down to us by the earliest historians. "Spices have always been regarded as luxurious acquisitions, while their small comparative bulk, and consequent facility of transport, caused them to be amongst the first articles of commerce obtained from remote countries. The inhabitants of more temperate regions have, therefore, for ages been in the enjoyment of most of the most delicious aromatics fostered by a tropical sun."—*Library of Entertaining Knowledge*.

Arabia Felix is said to have obtained its name from the ancient

geographers on account of its odoriferous plants ; and as the rest of the then civilized world procured their spices from that country, they, in their imperfect knowledge of geography, concluded that these spices were its natural produce, not considering that it was possible for this supply to be obtained from a country much more remote. It is conjectured, and on pretty good authority, that the spices presented by the Queen of Sheba to the wise monarch of Judah were procured from Ceylon, or the islands still farther to the east.

THE CINNAMON TREE (*Laurus cinnamomum*).

This tree has been an inhabitant of our stoves since 1763. In its natural state it attains the height of from twenty to thirty feet, but when cultivated for its bark it is kept cut like a coppice, numerous shoots springing from the roots, which are not allowed to rise above ten feet. "In three years after planting, each tree affords one shoot fit for cutting ; at the fifth year from three to five shoots may be taken," and in eight years it yields as many as ten shoots, each an inch in thickness. When from ten to twelve years old it is considered in perfection, but will continue much longer, as an extension of the root enables it to send up fresh supplies of shoots for years. The shoots are cut when of the above thickness, and then into lengths of from two to three feet, and when properly dried it is fit for exportation. Besides Ceylon, it grows plentifully in Malabar, Cochin-China, Sumatra, and the Eastern Islands. It has been cultivated in the Brazils, the Mauritius, India, Jamaica, and other places. The soil in which it thrives best is nearly *pure quartz sand*. That of the cinnamon garden near Colombo, in Ceylon, was found by Dr. Davy to consist of 98·5 of silicious sand, and 1·0 only of vegetable matter in 100 parts. "The garden is nearly on a level with the lake of Colombo : its situation is sheltered : the climate is remarkably damp : showers are frequent, and the temperature is high and uncommonly equable."—*Davy's Ceylon*.

The Cinnamon tree is considered difficult to cultivate in England, even in our best regulated stoves. The Messrs. Loddiges appear to be more successful in this respect than most cultivators, and that may perhaps be accounted for by their keeping their stoves much warmer than is generally done by the best gardeners. A mixture of sandy loam and peat is recommended by Sweet as the best kind of soil, the pots being well drained prior to the plants being placed in them. But it is

very probable that a soil of a more sandy nature may be more congenial to it.

THE CASSIA (*Laurus cassia*.)

The Cassia of commerce is chiefly supplied from China, and it is altogether a much hardier plant than the cinnamon, and succeeds better in cultivation. The same soil and treatment, however, are requisite.

CAMPHOR (*Laurus camphora*).

The Camphor tree is a hardy greenhouse plant, and is of the easiest culture, requiring only to be protected from frost. Camphor is obtained by subjecting the roots and smaller branches to distillation. It is probable that the whole family of *Laurus* might be grafted or enarched on the common *Laurus nobilis* with success.

CLOVE (*Caryophyllus aromaticus*).

It is a curious fact, that although Europeans have known the use of this spice for more than two thousand years, yet it is little more than three centuries since they discovered from whence it was obtained. The tree was introduced into this country in 1797, by Sir Joseph Banks, but it has been found so difficult to cultivate, that very few specimens of it are at this time to be met with, even in our best botanical gardens. The difficulty in its cultivation is not confined entirely to the gardens of Europe, for we find that even in the tropics it is not easily established. An account of its culture in Dominica by M. Buée is given in the *Tropical Agriculturist*, a work replete with excellent information on all that relates to such matters. After several disappointments, M. Buée found that the clove succeeded best "in a sterile soil, composed of a yellowish or reddish stiff clay, such as that in which the pimento flourishes, but which, for the generality of crops, is scarcely fit for cultivation." As the clove has hitherto been considered of difficult cultivation, we may be excused for making the following quotation from the practice of M. Buée, as the intelligent English gardener may draw from it some useful conclusions: "The seeds were sown about six inches apart from each other, in beds. Over these beds some small frames were erected, about three feet from the ground, and plantain leaves were spread on the top, in order to shelter the young plants from the sun. The leaves were allowed gradually to decay, and at the end of nine months the young plants, which by

that time were strong, were allowed to receive the benefit of the sun ; but if not protected from it when very young, they were found to droop and die. When transplanted they grew very luxuriantly, and, at the end of fifteen months after their removal, attained the height of from three to four feet."

From the work above quoted we learn that "the cloves sent from St. Vincent's to England in 1800, were obtained from trees eight feet high, having a stem only two inches in diameter. Trial was made in this island of the relative growth of the plant on different soils. It grew sickly on land that was not manured, but on land which had received this preparation it flourished. It should be planted in a situation where it is not exposed to high winds." In the *Ency. of Plants* it is stated to grow freely in loam and peat, and that ripened cuttings are not difficult to root in sand, in a moist heat, under a hand-glass. Peat and loam is, however, we fear, much too light a soil, and we would rather recommend a trial of strong brick earthy loam, with very little manure, and well exposed to the weather before using.

#### GINGER (*Zingiber officinale*).

It is now matter of dispute whether the *amomum* which Pliny describes be identical with the ginger of the present day, or not; be this as it may, the importation of ginger forms no inconsiderable item in the imports of this country. We find that in 1830, no less than 5491 cwt. were received, producing a revenue of £2800. The cultivation of ginger is exceedingly simple, requiring much less care than a crop of potatoes in Europe. That ginger would be worth cultivating in this country as a plant of commerce, we do not mean to insinuate, any more than that any of the other tropical productions we have been treating of could be grown here at a cheaper rate than they could be imported from their native country. It is the pleasure and satisfaction that the proprietor would derive from growing the productions of the tropics within our northern latitudes, and the hope of recalling to his mind perhaps pleasing associations, should he have been for a time a resident in those countries; and besides that species of gratification, there is the pleasure of showing how much the art of man can render subservient to his wishes the whole vegetable kingdom, and place upon his table the fruits of the torrid, frigid, and temperate zones.

The cultivation of ginger for the purpose of making the most delicious and wholesome of all tropical preserves, namely, preserved ginger, which



cannot be done with imported roots, is perfectly within the means of almost every one who has a hot-house, or even hot-bed. To cultivate ginger for this purpose, plant the tubers, before they spring into shoot, into flat boxes, or pots, a foot in depth, and place them in any part of a well-regulated plant stove, pine house, &c. Supply them with water as they may require, until autumn, when the leaves begin to turn yellow and the stalks to dry up and wither, at which period decrease the quantity of water until it be entirely withheld, when the stems die down to the surface of the mould. During winter they should be kept dry, and excited again in spring. If the purpose be to increase the number of roots for the purpose of obtaining stock, separate the tubers and replant them again; but if it be desired to have part of the produce taken for use, separate only enough for stock, leaving such as are intended for immediate use in the pots or boxes, giving a little water to them to cause them to push into shoots. When these shoots have attained the height of five or six inches, they should be then taken up for use. A deep pit, prepared with hot leaves, tan, or dung, or even a deep frame, placed on a common hot-bed, would be a very proper place to plant out the ginger tubers, in rows one foot apart, and the plants six inches distant in the line. A moderate bottom heat, maintained till about the end of June or beginning of July, would produce a sufficient quantity of green ginger roots, from three or four lights, to supply a large family.

The best way to preserve ginger is thus: when the young stalks are not more than five inches long, the roots should be taken up and scalded, washed in cold water, and then entirely peeled. "This operation requires three or four days for its completion, the water being frequently changed during that time. The roots being cleaned, are now placed in jars and covered with a weak syrup, in which they are allowed to remain for two days, at the end of which period this is poured off and replaced with a stronger syrup. This operation is repeated two or three times, at each time the syrup being made stronger, until it becomes a rich and thick consistency, and the ginger appears bright and nearly transparent. The removed syrups are not wasted: they are made into a pleasant beverage, which is known in the West Indies under the name of *cool drink*."—*Tropical Agriculturist*, p. 322.

#### PIMENTO OR ALLSPICE (*Myrtus pimenta*)—

Is a native of South America and the West Indies; it is also well known as a stove plant in our gardens. It is one of the few Tropical Fruits that

are produced in general cultivation with us. It is very productive, one hundred and fifty pounds weight of the fruit being often procured from a single tree. In the year 1835, we saw, in the large Tropical House of the Duc d'Arenberg, at Enghien, in the Netherlands, a pimento tree on which there could not be less than six or seven pounds weight of fruit in the fullest perfection.

In regard to propagation and culture, this tree differs not from that of other species of the genus *Myrtus*, or, indeed, of hard-wooded stove plants in general.

#### NUTMEG (*Myristica moschata*).

Two species are obtained from this tree, viz., the nutmeg and mace. The former is the stone or kernel, as it were, and the latter is the membranous covering immediately over the shell. The nutmeg is rare in our gardens, but is capable of cultivation by following the same routine as recommended for the Cinnamon (*Laurus cinnamomum*).

## SELECT LIST OF TROPICAL FRUITS.

Achocon (*Leonia glyxicarpa*).  
 African Custard Apple (*Anona senegalensis*).  
 Alligator Apple (*Anona palustris*).  
 Alligator Pear (*Laurus persica*).  
 Akee Tree (*Blighia sapida*).  
 Anchovy Pear (*Grias cauliflora*).  
 Barbadoes Gooseberry (*Pereskia aculeata*).  
 Bastard Guava (*Eugenia pseudo-Psidium*).  
 Banana (*Musa sapientum*).  
 Black Plum (*Vitex umbrosa*).  
 Bread Fruit (*Atrocarpus incisa*).  
 Bread-nut Tree (*Brosimum Allicastrum*).  
 Blimbing (*Averrhoa carambola*).  
 Butter and Tallow Tree (*Pentadesma butyracea*).  
 Bengal Quince (*Ægle Marmelos*).  
 Callimato Tree (*Chrysobalanus Icaco*).  
 Caraunda (*Cirassa carandus*).  
 Country Plum (*Spondius*, various sp.).  
 ——— Grapes (*Vitis cæsia*).  
 ——— Currants (*Antadesma* sp.?).  
 ——— Cherries (*Malpighia*, various sp.).  
 Cherimoyer (*Anona Cherimolia*).  
 Cocoa-nut (*Cocos nucifera*).  
 Cocoa Plum (*Chrysobalanus Icaco*).  
 Cheremi (*Averrhoa acidula*).  
 Cashew Nuts (*Anacardium occidentale*).  
 Coffee Tree (*Coffea arabica*).  
 Custard Apple (*Anona reticulata*).  
 Durion, the (*Durio zebethinus*).  
 Earth-nut (*Arachis hypogæa*).  
 Fig (large, of Sierra Leone), (*Ficus Brassii*).  
 Fig (small of Sierra Leone), (*Ficus* sp.?).  
 Guava, Red (*Psidium pomiferum*).  
 Guava, Cattle's (*Psidium Cattle-anum*).  
 Guava, Wild (*Psidium pyrifera*).  
 Garlic Pear (*Cratæva Tapia*).

Gingerbread Plum (*Piranarium macrophyllum*).  
 Granadilla (*Passiflora quadrangularis*).  
 ——— Apple-fruited, or Sweet Calabash (*Passiflora maliformis*).  
 ——— Laurel-leaved, or Water Melon (*Passiflora laurifolia*).  
 ——— Purple-fruited, (*Passiflora edulis* ? *incarnata* ?)  
 ——— Flesh-coloured, (*Passiflora incarnata* Linn.).  
 Hog Plum, or Yellow Plum (*Spondias myrobalanus*).  
 Jambrosade, or Rose Apple (*Eugenia jambos*).  
 Jack Fruit (*Atrocarpus integrifolia*).  
 Jujube (*Zizyphus jujube*).  
 Indian Fig. There are several species of *Opuntia* that produce fruit in their native country, and are hence called Indian Figs, or Prickly Pears: of these the principal are *O. Ficus indica*, *O. vulgaris*, *O. monacantha*.  
 Lansel (*Lansium domesticum*).  
 Launzan (*Buchanania latifolia*).  
 Lee-chee (*Euphoria Litchi*).  
 Long-yen (*Euphoria Longan*).  
 Lo-quat (*Mespilus japonica*).  
 Lotus (the true), (*Zizyphus Lotus*).  
 Locust Tree, or Nety of the Negroes (*Inga Biglobosa*).  
 Malay Apple (*Eugenia malaccensis*).  
 Mammee Tree (*Mammea americana*).  
 Mammee Apple (*Mammea africana*).  
 Mango Tree (*Mangifera indica*).  
 Mangosteen (*Garcinia mangostana*).  
 Muridoo, or Elephant's Apple (*Ægle marmelos*).  
 Melon Thistle (*Melocactus communis*).  
 Monkey Bread (*Adansonia digitata*).  
 Monkey Apple (*Anisophillea laurina*).  
 Otaheite Chestnut (*Inocarpus edulis*).  
 Plantain Tree (*Musa paradisiaca*).

Pinaou (*Anona punctata*).  
 Pinaioua (*Anona longifolia*).  
 Prickly Pear (Various species of *Opuntia*).  
 Pishamin (sour), (*Carpodinus acidus*).  
 Pishamin (sweet), (*Carpodinus dulcis*).  
 Pigeon Plum (small), (*Chrysobalanus ellipticus*).  
 Pigeon Plum (yellow), (*Chrysobalanus luteum*).  
 Queule, or Keule (*Gomortega nitida*).  
 Rambutan (*Nephelium lappaceum*).

Rouge-skinned Grey Plum (*Parinari excelsum*).  
 Sapodilla Plum (*Achras sapota*).  
 Sea-side Grape (*Cocoloba uvifera*).  
 Sweet Sop (*Anona squamosa*).  
 Sour Sop (*Anona muricata*).  
 Star Apple (long-leaved), (*Chrysophyllum macrophyllum*).  
 Star Apple (obovate-leaved), (*Chrysophyllum obovatum*).  
 Tomi-tomi (*Falcourtia inermis*).  
 Tamarind (*Tamarindus Indicus*).

## THE SCITAMINEÆ, OR REEDY PLANT STOVE.

THE natural order *Scitamineæ*, although by no means extensive, is certainly one of the most beautiful families in the whole vegetable kingdom; and so very distinct are the species which compose it from all others, especially in external habits and forms, that they accord ill in appearance when cultivated indiscriminately amongst other Tropical Plants. There are also some particulars in their cultivation which differ from that followed with plants generally. To this order belong some plants of considerable commercial interest, such as the Ginger (*Zingiber officinale*), Turmeric (*Curcuma longa*), formerly much used in cookery, and still used in the East Indies for dyeing; Galangale (*Kæmpferia galanga*), Costus, Turmeric, Zedoary, Cardamom, &c.

To the true order *Scitamineæ*, as far as cultivation is concerned, that of *Cannæ* may very properly be added.

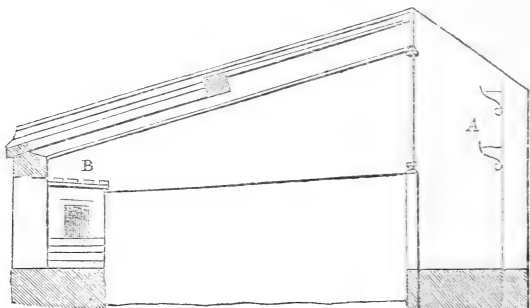
Of these two orders there are only two or three species that are not natives of the tropics, and it may be stated as rather a curious circumstance, that the greater part of the former possess highly aromatic properties, which chiefly reside in the roots; while these properties are entirely wanting in the latter, although similar in structure and general appearance, and natives of the same localities.

In neither order does one ligneous plant exist, the whole assemblage being made up of stemless herbaceous plants, with long, broad leaves, and flowers of great beauty, possessing considerable fragrance. The Cannas are well known for their beautiful flowers, and also as forming the first genus in the sexual system of botany, being possessed only of one stamen and one style.

This order had never been elucidated in a botanical point of view, till within these few years, when it was completely revised by that accomplished scholar and accurate botanist, the late W. Roscoe, Esq. The cultivation of it has also been much neglected hitherto, notwithstanding the high claims it has to our care and attention.

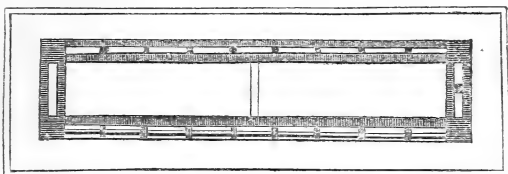
*Alpina nutans* is the only plant of the above orders that exceeds eight or ten feet in height ; a low structure is, therefore, all that is required for growing them to perfection. As they are herbaceous, and of course, during a considerable period in each season, in a leafless or dormant state, they are not well calculated for a place amongst other stove plants, which retain their habits and foliage during all seasons.

Where it is intended to cultivate these plants in the first degree of excellence, it will be requisite to appropriate to them a small house or deep pit, in which they are to be at all times kept, unless during the period when they are in flower ; and as many of them continue for a long time in that state, they may then be placed into the regular stove, or, if during summer, in the greenhouse or conservatory. Such a structure

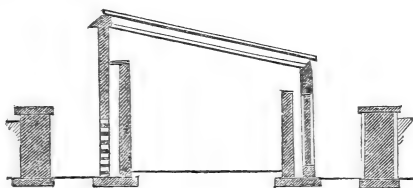


as that represented in the annexed sketch will be found all that is required. In such a house we have for several years flowered about thirty species, with little trouble or expense. The house is thirty feet in length and ten feet wide. A flue runs parallel to the front wall, entering at the back at one end, and passing out at the other. A deep pit occupies the middle, in which the plants are plunged, or set on the surface, as the case may be, according to their state of growth. The smaller growing kinds are placed on the trellised platform B, over the flue in front ; and the pots containing dry roots are kept on the shelves A, and also over the flue, at the coldest end of the house. A foot path passes along the back of the pit, three feet wide, and, to economize glass, the roof over this passage is covered with slates. Ventilation is admitted by the doors, and also by letting down the top tier of roof lights and pushing up the bottom ones. They may

also, be grown to great perfection in pits of the annexed description, and when coming into flower be removed to the Moist Plant Stove, where they will flower in perfection.

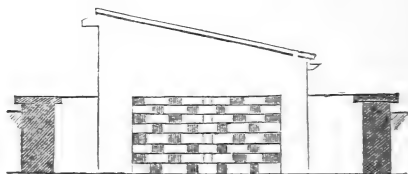


To those who may not immediately comprehend the principle of the annexed pit, the following explanation will be of use. The inventor, W. Atkinson, Esq., being aware of the danger which often attends the admission of rank steam into forcing-pits, directed his attention to the



subject, with a view to remedy its defects, and the pit before us is the result of his ingenuity. The pit is sunk under the ground level about one-half of its height, as shown in the sections, and is heated by linings, applied in the usual way, round its sides and ends. The interior is filled with either dung, tan, or leaves, the latter in all cases to be preferred. The heated air from the linings, which should be of fresh unfermented dung, enters through the back wall, between the open courses of brickwork; but the rank steam is prevented at the same time from entering immediately to the plants, as it is admitted into the cavity between the walls and a partition formed of large Welsh slates set edgeways, where it is confined or let out at the pleasure of the cultivator, as this cavity is covered over at top with narrow slips of slate or boarding, which can be left on or removed at pleasure. When the intention is to admit the heat unaccompanied with steam, this covering is kept on, and the heat finds its way into the bed through the slates; but when it is desirable to admit damp vapour or steam, the covering is partially or wholly removed. With

respect to the front linings, the heat has to find its way through Welsh slates, which are introduced into the front wall, which is carried up in brick piers, between which the slates are set like panels ; therefore, no



noxious vapour can enter from the front linings. The heat from this is chiefly intended to warm the atmosphere of the pit. The advantage of this pit is manifest : like that of M'Phail, rank dung may be used with safety, but it has this important advantage over it,—that a much smaller quantity is required to heat it.

The linings may be covered with boarding, which retains the heat, affords shelter from rain, furnishes a convenient passage to walk upon, and gives the whole an air of compactness and cleanliness which never can be effected while the linings are left uncovered. We have been thus particular in describing the pit, as it is capable of being applied to almost every purpose the plant cultivator can require. It is an excellent propagation pit, either for stove or greenhouse plants, whether they are raised by seeds, cuttings, graftings, or any of the modes in use. It is well calculated for forcing flowers, and also for growing small and young plants. It is a good winter habitation for dry bulbous or tuberous-rooted plants that require a season of rest, and will also serve as a hospital for such as are weakly or diseased.

#### GENERAL ROUTINE OF CULTURE.

The Scitamineæ or reedy plants are all perennials, and readily multiplied by division of the root ; many of them, however, produce seeds which vegetate freely. The best season for propagating by the former of these modes is just before the roots begin to push out into shoots, which circumstance occurs at various seasons, according to the natural habits of the species, or the mode of cultivation it has been subjected to the preceding year. This, like many other points in horticulture, can only be correctly ascertained by observation ; for the cultivator who depends upon



positive data being laid down for him in books, will ever cut a sorry appearance compared with him who makes observation his principal guide. The roots being taken out of the pot, and the mould entirely displaced, the operator will readily see where he can cut to best advantage, that is, to divide the roots so as to cause the fewest wounds. Every portion of these roots having a crown or top uninjured, will make a future plant: where the object is to multiply them to a great extent, all the old root may be completely separated into small pieces, and each of these pieces planted in a separate pot, regulating its size according to their lengths, &c. Where the object is to cultivate for the production of fine-flowering specimens, then the superfluous roots only should be removed, and so far as possible the older ones should be selected for removal. A separation of the roots annually, or every second year at the farthest, is necessary for the perfect cultivation of this tribe.

The diminutive-growing species, of which there are but few, will require small pots; but the majority, which are strong-growing, large-rooted plants, will require very large pots to enable them to produce fine flowers. Indeed, if any enterprising cultivator would erect a small house into which they could be planted out into a properly prepared bed, there would be no doubt of the success. A most intelligent horticulturist has proposed, and we have elsewhere noticed it, that many of these plants, particularly the *Cannas*, would flower magnificently if planted out in a border in the open garden where artificial heat could be supplied to their roots, and a portable frame and glass covering placed over them during their season of growth.

A rich, light, sandy, loamy soil is the most proper for them, and if planted in such in large pots, or tubs, and placed in a high temperature and humid atmosphere at the time that they begin to show signs of vegetation, or at the period when it would be desirable for them to do so, and supplied abundantly with water during their growth, there will be no difficulty in flowering them in perfection. When the flowering season is past, the plants will then begin to assume a yellowish colour: when such is perceived, water should be given in less quantities progressively, until withered altogether. When the leaves are dead, the stems should be cut down, and the plant placed in a dry, rather cool place to enjoy a season of repose. The pots may be laid over on their sides, by which means water will be better excluded, for the more dormant the roots remain for a few weeks or months, the stronger will they break when excited again in the spring, or at the season when vegetation is again to be encouraged in them.

With these plants, as with bulbs, (as we have already observed when

treating of them in the BULB HOUSE), the malpractice of keeping them in a constant state of excitement is almost universally followed: nothing can be worse than this, more unnatural, and indeed fatal to them; and were it not that both are so tenacious of existence, a continuation of the practice would not only, as we daily see, prevent them from flowering, but would in the end kill them altogether. All plants require a season of rest, as much as animals require a season of sleep; but some plants show the effects of being deprived of that natural rest sooner than others.

On the culture of ginger we find the following simple and judicious directions detailed by a correspondent in the *Gardener's Magazine*, vol. vii. p. 577:—"In the beginning of March I pot my ginger into small thirty-twos, the compost I use being equal quantities of loam, rotten dung, and leaf mould, well mixed together, but not sifted. As soon as I have potted it, I give a little water to settle the soil, and then place it in a nursery or stove, watering very sparingly until it begins to grow, when it will require a regular supply. About the 1st of May, I remove it to a deep pit, previously prepared with about two feet of half-spent tan in the bottom: upon that about eighteen inches of the same compost as that in which I potted the roots. I then turn the plants out of the pots, and plant them a foot apart each way, and from four to six feet from the glass, giving them a little water immediately, and closing the pit. At the back of the pit my plants have generally attained the height of six feet, and those in the front, for want of space upwards, have bent and sometimes broken their tops against the glass; yet I never perceive the roots any way inferior to those at the back. If these three things—a rich, light compost, a high temperature, and an abundant supply of water when the plants are in a growing state—be attended to, they will insure a good crop of ginger.

"Very little air is requisite, even in the hottest days of summer. By the middle or end of September the ginger will be fit for taking up. I then divide the roots with a knife, saving the largest races [roots or tubers] for preserving. The small ones, with their tops as little damaged as possible, I pot, and set into the pit again, giving them a little water to settle the soil at their roots. They will only require twice watering after this, until their tops or stems are dead, which will be about the end of October. The pots must be set into some dry shed, where the frost cannot reach them. They will require no farther care until the following March, when they must be again brought out, and treated as above directed. When pits cannot be spared, dig a hole in the open garden,

and put a frame over it. If tan be unattainable, leaves, and a little long manure mixed, will do quite as well." This is an economical method of growing a supply of ginger for preserving, and is worth the attention of those who are fond of that wholesome and pleasant preserve. It should be remembered that dry imported roots will not answer the purpose, and unless the connoisseur grows his own supply he must depend upon imported preserves, which are both expensive and often of very inferior quality.—See TROPICAL FRUIT HOUSE.

## SELECT LIST OF SCITAMINEÆ OR REEDY PLANTS.

## WHITE.

- Slender Garland Flower. (*Hedychium gracile*.) Flowers in June and July, in sandy loam. Division of the roots.
- Official Galangale. (*Kæmpferia Galanga*.) Flowers from June to September, in sandy loam. Division of the roots.
- Narrow-leaved Galangale. (*Kæmpferia angustifolia*.) Flowers from March to May, in sandy loam. Division of the roots.
- Broad-leaved Galangale. (*Kæmpferia latifolia*.) Flowers in April and June, in sandy loam. Division of the roots.
- Oval Galangale. (*Kæmpferia ovalifolia*.) Flowers in July and August, in sandy loam. Division of the roots.
- Loose-flowered Alpinia. (*Alpinia Galanga*.) Flowers from July to September, in sandy loam. Division of the roots.
- Clustered Alpinia. (*Alpinia racemosa*.) Flowers from October to February, in sandy loam. Division of the root.
- Occidental Alpinia. (*Alpinia occidentalis*.) Flowers in April and June, in sandy loam. Division of the roots.
- Upright Alpinia. (*Alpinia calcarata*.) Flowers from September to October, in sandy loam. Division of the roots.
- Petiolate Alpinia. (*Alpinia malaccensis*.) Flowers in April and May, in sandy loam. Division of the roots.
- Spurless Alpinia. (*Alpinia mutica*.) Flowers from August to September, in sandy loam. Division of the roots.

## YELLOW.

- Yellow Indian Shot. (*Canna lutea*.) Flowers from January to December, in rich mould. Division of the roots.
- Glaucous Indian Shot. (*Canna glauca*.) Flowers from June to August, in rich mould. Division of the roots, and seed.
- Sweet-scented Garland Flower. (*Hedychium coronarium*.) Flowers from June to September, in peaty loam. Division of the roots.
- Tall Garland Flower. (*Hedychium elatum*.) Flowers from June to December, in sandy loam. Division of the roots.
- Gardner's Garland Flower. (*Hedychium Gardnerianum*.) Flowers from June to August, in sandy loam. Division of the roots.
- Yellow Garland Flower. (*Hedychium flavum*.) Flowers in June and August, in sandy loam. Division of the roots.
- Variable Garland Flower. (*Hedychium hetromallum*.) Flowers from June to August, in sandy loam. Division of the roots.
- Pale Yellow Garland Flower. (*Hedychium flavescens*.) Flowers from June and August, in sandy loam. Division of the roots.
- Spiked Garland Flower. (*Hedychium spicatum*.) Flowers from June to July, in sandy loam. Division of the roots.

## RED.

- Spreading Indian Shot. (*Canna patens*.) Flowers from May to July, in rich mould. Division of the roots.
- Common Indian Shot. (*Canna indica*.) Flowers from January to December, in rich mould. Division of the roots.
- Gigantic Indian Shot. (*Canna gigantea*.) Flowers from January to December, in rich mould. Division of the roots.

Eatable Indian Shot. (*Canna edulis*.)  
Flowers from September to December, in rich mould. Division of the roots.

Showy Indian Shot. (*Canna speciosa*.)  
Flowers from August to September, in rich mould. Division of the roots.

Tubular Alpinia. (*Alpinia tubulata*.)  
Flowers in July and August, in sandy loam. Division of the roots.

Ceylon Alpinia. (*Alpinia Allughas*.)  
Flowers from February to March, in sandy loam. Division of the roots.

Round-rooted Galangale. (*Kempfera rotunda*.) Flowers in July and August, in sandy loam. Division of the roots.

Bordered Indian Shot. (*Canna limbata*.) Flowers from January to December, in rich mould. Division of the roots.

Variable Indian Shot. (*Canna variabilis*.) Flowers from January to December, in rich mould. Division of the roots.

Red Indian Shot. (*Canna rubra*.)  
Flowers from January to December, in rich mould. Division of the roots.

Red-stemmed Indian Shot. (*Canna rubricaulis*.) Flowers in May, in rich mould. Division of the roots.

Flaccid Indian Shot. (*Canna flaccida*.)  
Flowers from June to July, in rich mould. Division of the roots.

Striped-leaved Calathea. (*Calathea zebrina*.) Flowers from January to December, in rich mould. Division of the roots.

Narrow-leaved Ginger. (*Zingiber officinale*.) Flowers from June to August, in sandy loam. Division of the roots.

## PURPLE.

Purple Roscoe. (*Roscoe purpurea*.)  
Flowers from June to July, in sandy loam. Division of the roots.

Fiddle-shaped Galangale. (*Kempfera pandurata*.) Flowers in April and

June, in sandy loam. Division of the roots.

Opera Girls. (*Mantisia saltatoria*.)  
Flowers from June to July, in sandy loam. Division of the roots.

## SCARLET.

Scarlet Indian Shot. (*Canna coccinea*.)  
Flowers from January to December, in rich mould. Division of the roots.

Scarlet Garland Flower. (*Hedychium angustifolium*.) Flowers from June

to September, in sandy loam. Division of the roots.

Lambert's Indian Shot. (*Canna Lambertii*.) Flowers in May, in rich mould. Division of the roots.

## ORANGE.

Stalked Indian Shot. (*Canna pedunculata*.) Flowers from September to December, in rich mould. Division of the roots.

## PINK.

Nodding Alpinia. (*Alpinia nutans*.)  
Flowers in April and June, in sandy loam. Division of the roots.

Drooping Alpinia. (*Alpinia cernua*.)  
Flowers in April and June, in sandy loam. Division of the roots.

## THE CRYPTOGAMIC STOVE.

THE plants which compose the twenty-fourth class of the Linnæan arrangement, called Cryptogamia, differ essentially from all others in the peculiar conformation of their organs of fructification. In the higher classes of plants the male and female organs are visible, and either exist in the same or on distinct flowers in the same plant, and sometimes in distinct plants altogether. The former or hermaphrodite order is by far the most general. In Cryptogamic plants the fructification either consists of buds under a particular form, or in small vessels containing a powdery substance analogous to seeds, but differing from all seeds in not being the result of impregnation, and also in having the extraordinary power to strike roots from any end, or even from any point of their surface.

Hence this class has very properly been called *Cryptogamia*, signifying a hidden or clandestine marriage. The seeds are exceedingly minute, and require a powerful microscope to render them visible. Indeed, most of the older botanists were almost convinced that they had no seeds at all, and those who were less confirmed in this opinion believed them to be so rarely found as to render invisible the person who could collect them.

Of all the tribes of plants which constitute this extensive class, that of the *Filices* or Ferns is the most beautiful, and at the same time most capable of cultivation. Many of the *Musci* or Mosses, and some of the *Hepaticæ* or Liverworts, may, however, be successfully cultivated also.

### STRUCTURE BEST CALCULATED FOR CULTIVATING CRYPTOGAMIC PLANTS.

Cryptogamic plants are found in the hottest and coldest climates, as well as in those that are temperate. The largest and most splendid, as well as the majority of them, are from the tropics; a stove temperature, therefore, must be maintained where the culture of them is to be indulged

in. The natural habitats of the majority of ferns, as well as mosses, are in shaded places, and where the wind has little effect upon them; for, indeed, their delicate and often broadly-expanded fronds are ill-suited to resist the fury of the tempest. They appear to accommodate themselves in a cultivated state, and also to exist naturally, in a much closer and less rarified atmosphere than that of any other plants, and even to dispense with a certain portion of light better than any of the vegetables constituting the phœnogamous classes.

The structure, therefore, which we think best calculated for their cultivation would be a low, closely-glazed house or large pit, having a northern exposure. There is a considerable degree of difference in the size of ferns, as well as that of other plants; and that difference frequently exists in the same family or genus, some not exceeding half an inch in height, while others reach three or four feet in the frond; while not a few of the tropical species are very rampant growing climbers, and some are stately trees.

Such being the case, we would propose a house of the ordinary sloping roof form, about eight feet high at the back, and ten feet wide; its length may be twenty or thirty feet, according to the extent of the collection intended to be grown: but a house of the above dimensions would contain a very complete one. The internal arrangement of such a house might comprise a platform of brick-work four feet wide next the back, upon which the taller and stronger sorts should be placed. The foot-path should not be less than three feet in width, and a front platform of three feet next to the front glass for the accommodation of the lower-growing kinds. Both these platforms should be laid with closely jointed foot-tiles to retain moisture at the bottom of the pots, and round the margins a projection should be raised of one or two inches, or more, for a like purpose. Still further to increase the humidity, which should be maintained as equable as possible, the pots in which the plants are grown should be plunged in moss, various species of *hypnum*, &c.

The house should be heated with hot water, which might be procured from the boiler employed in heating any of the other stoves, which may occupy a southern exposure, and be connected with the Cryptogamic House, one common wall serving for the back of both: by this mode of arrangement a passage may be opened between them, which would be very advantageous and convenient.

The cultivation of these plants has not yet been very much attended to, and those who have occupied themselves therein have been contented by merely setting apart for them a portion of the general stove; but far

oftener placing them on back flues or shelves, where they were seldom seen, and as seldom attended to, in regard to watering, potting, &c. : the consequence was, that most of the rare and delicate species introduced have been lost from mere neglect. The best collections of ferns with which we are acquainted are those of Messrs. Loddiges, the Liverpool and Glasgow Botanical Gardens, Mr. John Allcard, and the Kew Garden. The latter collection may be said to owe its origin (at least as a respectable collection) to Mr. John Smith, the principal assistant, who is one of the best Cryptogamic botanists of the present day. Mr. Smith has originated most of the rare species in the Kew Garden from seeds brushed off dried specimens in his own herbarium. The Glasgow collection has long been maintained by our excellent friend Mr. Murray, the curator, and furnished many specimens to Sir W. J. Hooker for his splendid work on this order of plants. The Liverpool Cryptogamic collection owes its origin to Mr. H. Shepherd, who was perhaps the first practical British gardener who succeeded in growing ferns from seed. The fine collection of Mr. Allcard is in a great degree owing to the enthusiasm of Mr. Bevis, his intelligent gardener, who, like Mr. Smith, has originated thousands of young plants from seeds brushed off the back of dried specimens.

Mr. Ward, a medical gentleman of great respectability, has, we are informed, a fine collection growing in the rooms of his house in Wellclose Square, London, one of the last places the ordinary cultivator would have thought of to establish a system of plant culture. The Horticultural Society of London has revived the culture of ferns by offering prizes for the best cultivated collections brought to their exhibitions, and this we know has so far acted as a stimulus as to have already induced several cultivators to direct their attention to the subject.

Although ferns do not display such a variety or brilliancy of colours as many other tribes, still they are not wanting in interest to the lover of plants, independently of the vast and interesting field which they open to the scientific botanist for investigation. They are for the most part evergreen, that is, under good culture; a collection of them at all times, and at all seasons, presents a very perfect whole when viewed in a house by themselves. They do not associate well with other plants, excepting mosses, many of which might be cultivated amongst them. They do not appear to prosper if often removed, or even changed in their position. The Orchideæ House appears to us to be the place best adapted to these plants when a separate house is not dedicated entirely to themselves.

So involved in mystery is the production of Cryptogamic plants by seeds, that we cannot do better than give the following extract upon this



subject from Mr. France's interesting work on British Ferns :—"The reproduction of ferns is a subject involved in much obscurity. Hedwig, Bernhardt, and others have proposed theories to explain this intricate matter, without success. That the ferns have no visible flower, is evident, but that they have some apparatus analogous to stamens and anthers, is maintained by many of our first botanists. This opinion has evidently been adopted merely to get rid of the doctrine of spontaneous impregnation, which, however unsatisfactory, must not wholly be discarded until something more plausible be substituted. At present nothing whatever has been discovered of the origin of the germinating principle in any of the Cryptogamic orders, nor the laws which regulate the developement and arrangement of their spores. As regards our present tribe, so keen has been the search, that every part of the plant has been subjected to the minutest investigation, not only the thecæ, their ring, and their cover, but the spiral vessels of the rachis, the stomata upon their cuticle, and the glands which are sometimes found attending upon them.

"*Seeds or Spores.*—The small, round, rough grains contained in the thecæ, considered formerly as gemmæ or buds, are now known as seeds, but differing from common seeds in many respects. They have no cotyledons, but are a mass of cellular substance. Instead of sending up a plumule, and downwards a radicle, from fixed points, they grow indifferently from any part of their surface, that most exposed to light shooting into the future frond, while the deeper point propels the root. Owing to these differences the seeds have been called, not only here, but in all the tribes of Cryptogamic vegetables, spores (or sporules) rather than seeds. They retain their vitality for many years, and those brushed off from the dried plants of an herbarium will grow long after the specimens have been gathered, coming up first with a small crown or bud, from which soon issues a single leaf, or imperfect frond, not differing in texture from the future growth, though, as before stated, much less ramified."

Mr. Henry Shepherd, of the Liverpool Botanical Garden, has succeeded most successfully in propagating these plants by seeds. An account of his method will be found published at length in the *Transactions of the Horticultural Society*, from which we extract the following, as being quite sufficient to explain his practice :—"Having provided a common garden pot, four and a half inches deep, and three and a half wide, let the bottom part, to the height of one inch, be filled with fragments of broken pots by way of drain. Over these should be spread a stratum of such soil as is commonly used for potting greenhouse plants, of the depth of two inches ;

the remaining inch and a half should be filled with brown, loamy earth, sifted through a hair sieve, the surface being made perfectly smooth, and on this the seeds are to be scattered as evenly as possible. Care must be taken that the wind be not suffered to blow the seeds away, leaving nothing but empty capsules. The seeds being sown, no other covering is necessary than a bell-glass, which should just fit within the rim of the pot, so as to exclude all air. The pot is then to be kept in a pan always half full of water, and set in a shady part of the stove or hot-house, being always regularly watered as above directed. When the young plants have acquired their second frond or leaf, it is proper to give them a little air, by placing a small piece of wood under the edge of the glass at one side. In a short time afterwards the glass may be entirely removed."

According to the experiments of Messrs. Shepherd, Bevis, Smith, and others, the seeds of ferns do not appear to remain long after being submitted to a proper nidus before they vegetate. Seeds of *Gymnogramma tartarea* were brushed off a frond on the 10th of July, 1817, and on the 5th of August, 1818, the plants from these very seeds produced perfect seeds, which were immediately sown and produced young plants as thick as a crop of fine moss by the 8th of September following. Seeds obtained from specimens obtained through Dr. Carey from Semaphore, were sown on the 10th of July, and young plants were obtained by the 8th of September.

The seeds of ferns, unlike many other very small seeds, do not appear to lose their vegetative properties very soon, for we are informed by Mr. H. Shepherd, that he obtained plants from seeds taken from the herbarium of Dr. John Réenhold Forster, which were perhaps fifty years old. It is probable, if the seeds of ferns were kept dry and inclosed in their natural covering, that they would vegetate after being many years gathered. These plants appear to shed their seeds if the fronds be allowed to become too old and dry before gathered, and on the other hand, if the specimen be gathered too soon, that is, before the seeds be fully ripened, they will not vegetate at all. These circumstances should be considered whenever this experiment is to be reduced to practice. The seeds appear to be in the greatest perfection for sowing when the fronds are just beginning to turn brown, or rather when the fructification is beginning to turn brown on them.

Fern seeds will vegetate when thrown against a damp wall or sand-stone pavement, if kept moderately damp and not brushed over. We recollect once seeing a fine crop of young ferns produced by brushing dried specimens over large pieces of cinder clinkers placed in a damp

part of one of the stoves in the University's garden, at Liege. We have also obtained many by brushing the seeds upon a stem of *Cycas Circinalis*, which had no other attention paid them than the regular routine of the stove. We state these latter modes merely to show how easily these seeds vegetate, and not with a view to recommend the practice, as it is attended with chances of disappointment. The practice of Mr. Shepherd is at once simple and successful, and should be followed by those who wish to cultivate this interesting tribe of plants.

#### PROPAGATION BY DIVISION OF THE ROOT.

Many species are readily increased by division of the root, and also by runners, but all are rather impatient of the knife, particularly if the trunk or stem has to be wounded. The operation and after-treatment are so similar to that recommended for other herbaceous plants that any further notice would be superfluous.

#### SOIL AND CULTURE.

The soil which appears to suit the majority of ferns is of a light, rich nature: that formed of vegetable mould and sandy peat may in general be recommended. Certainly such as are of weak growth, and those that are half parasite, or growing upon old trees or decayed wood, can have no better soil. There are others, however, of more robust growth, which will require a much stronger soil.

Many of our British ferns will prosper vigorously when submitted to the temperature and treatment of the stove, although they will equally flourish when planted behind a wall in a moist and shaded situation. We mention this fact merely to show that, although most of our native ferns will thus far accommodate themselves to the circumstances they may be placed in, yet the art of man can hardly keep alive others which are also natives of our mountains, even in a cool shaded part of the garden; for example, *Pteris crispa*, *Grammitis Ceterach*, *Aspidium Lonchitis*, *Asplenium viride*, *marinum*, *lanceolatum*, *alternifolium*, and *septentrionale*, will languish, and in time die, if taken from their native habitats.

Need we then be surprised if in a collection, say of five hundred species, collected from all parts of the tropics, that some should refuse to submit to the fostering care of man. There are peculiar constitutional habits, perhaps we may call them diseases, in some plants, that renders all our care in their culture rather an aggravation of their disease than the re-

verse; and as our knowledge of these matters is still so limited, we must content ourselves with their loss, and endeavour to rest satisfied with the enjoyment of those that will submit to culture until experience teaches us how to overcome such difficulties.

Mr. Ward, of Well-Close Square, of whom we have already made mention, has succeeded even in what we should naturally call the worst of all localities, the centre of the city of London, in growing many species of ferns in a superior manner, and amongst them several that had hitherto baffled all the care, convenience, and skill of the gardener. Mr. Ward's success appears to depend on growing them in air-tight cases, suffering the moisture which their pores exude to be absorbed again by the roots, while at the same time they are preserved from external injuries and sudden changes of temperature. How long plants may be found to submit to this mode of culture we know not, but one fact is pretty well established—that plants have been imported from New Holland in such cases that never before reached Europe alive. Mr. Ward has not yet made public the principles of his theory, which would be most valuable were they generally known; he has, however, always shown the greatest liberality and kindness to cultivators and botanists, by allowing them to see his curious collection.

A somewhat similar practice has been long in use amongst cultivators, but from being a common-place matter has perhaps been less attended to than ought to have been the case. What we allude to is the practice of placing a hand-glass or large bell-glass over certain plants in the stove, such as *Dionæa muscipula*, *Hymnophyllum*, and *Trichomanes*, of which latter our esteemed friend Mr. Mackay, of Dublin, in his excellent *Flora Hibernica*, says he cultivates to perfection by placing the pot in which it is planted in the greenhouse under one of these glasses, which, in fact, is placing them in a position analogous to that of being under one of Mr. Ward's cases.

These opinions, for which we entertain the highest regard, confirm us in a long-entertained idea, that the atmosphere of a fern-house requires to be kept moist, warm, and as little acted upon by atmospheric changes as possible. These conditions being complied with, soil and all other species of nourishment are only secondary considerations.

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